

MINISTRY OF HEALTH OF UKRAINE
KHARKIV NATIONAL MEDICAL UNIVERSITY

Department of Medical and Biological Physics and Medical Informatics
Academic year 2021-2022

SYLLABUS OF THE EDUCATIONAL COMPONENT

«MEDICAL INFORMATICS»

(the title of the educational component)

Normative or selective educational component normative

Form of acquisition the education full-time
(full-time, part-time, remote)

Field of knowledge 22 «Health care»
(the code and name of the training direction)

Major field 221 «Dentistry»
(the code and title of the specialty)

Specialization (if available) _____

Educational and professional program (educational and scientific program) «Dentistry»


The second (master's) level of higher education

Year: 2

This syllabus was approved at the meeting of the department of medical and biological physics and medical informatics

Record № 7 dated
27 August 2021,

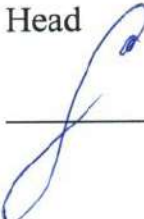
Acting Head of Department

 prof. O.V. Zaytseva

Approved by the methodological committee on international students training (KhNMU)

Record № 1 dated
31 August 2021,

Head



S.O.Krasnikova

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Consultations (face-to-face consultations: schedule and venue; online consultations: schedule, links to electronic resources): face-to-face and online consultations are conducted according to the schedule of the department or by prior arrangement with the teacher.

Location: Kharkiv, 4 Nauki Ave., main building, 2nd floor, Department of Medical and Biological Physics and Medical Informatics.

INTRODUCTION

The syllabus of the discipline «Medical Informatics» compiled in accordance with the Educational and Professional program (hereinafter – EPP) «Dentistry» and the Standard of Higher Education of Ukraine (hereinafter - the Standard), the second (master's) level, areas of knowledge 22 “Health Care”, specialty 221 «Dentistry».

Description of the discipline (abstract) The discipline «Medical Informatics» is taught to acquaint students with the laws and principles of information processes in systems of different levels of the hierarchy of health care, the problems of collecting, storing, processing and transmitting signals and images in medicine, decision support systems in medicine; information technologies of analysis, modeling, forecasting, management in the field of medical and biological research, the theory of medical information systems.

The subject of study of the discipline is the information processes in the field of health care, involving the use of digital technologies.

Interdisciplinary connections:

- is based on the study of a number of disciplines by students: medical and biological physics, medical biology, morphological disciplines and integrates with these disciplines;
- lays the foundations for the study of disciplines: social medicine, health care and biostatistics, epidemiology, hygiene and ecology, sociology and medical sociology, radiology (radiation diagnostics and radiation therapy);
- promotes the study of clinical, hygienic and social disciplines by students;
- is involved the effective use of digital technologies in the process of further education and professional activities.

Prerequisites. The study of the discipline «Medical Informatics» involves the preliminary mastering of credits in the discipline «Medical and Biological Physics».

Postrequisites. The main provisions of the discipline «Medical Informatics» should be used in the study of such disciplines as «Modern problems of biophysics», «Social Medicine», «Hygiene and Ecology», «Normal Physiology», «Physiotherapy», «Medical Radiology» (radiation diagnostics) and radiation therapy», «Biological Chemistry», «Ophthalmology».

Link to the discipline page in MOODLE –
<http://distance.knmu.edu.ua/course/view.php?id=777>

1. PURPOSE AND TASKS OF THE DISCIPLINE

1.1. The purpose of teaching the discipline is formation and development in future doctors of competence in the field of digital technologies for ensuring rational use of modern software of general and special purpose in the processing of biomedical data, studying the laws and principles of information processes in systems of different levels of the hierarchy in the field of health care, problems collecting, storing, processing and transmitting signals and images in medicine, decision support systems in medicine; information technology analysis, modeling, forecasting, management in the field of biomedical research, theory of medical information systems.

1.2. The main tasks of studying the discipline are: acquainting students with the laws and principles of information processes in systems at different levels of the healthcare industry hierarchy, problems of collecting, storing, processing and transmitting signals and images in pediatrics, decision support systems in pediatrics; information technologies of analysis, modeling, forecasting, management in the field of biomedical research, theory of medical information systems. As a result of studying the discipline, the student must know: 1) the possibilities for new healthcare information and communication technologies; 2) the basics of telemedicine and the future of digital technology; 3) basic concepts of databases, features of specialized databases of evidence-based medicine; 4) principles of formalization and algorithmization of medical problems, basics of modeling in medicine and pediatrics. Be able to: 1) independently master medical and general purpose software; 2) use computer technologies of visualization and statistical analysis of data of biomedical researches; 3) work with decision support systems in medicine and pediatrics leverage the capabilities of Web technologies.

1.3. Competences and learning outcomes, Competences and learning outcomes, the formation of which is facilitated by the discipline (relationship with the normative content of training of higher education, formulated in terms of learning outcomes in the EPP and Standard).

1.3.1. The study of the discipline provides students with the acquisition of **competencies:**

integral:

ability to solve typical and complex specialized tasks and practical problems in professional activities in the field of health care related to the use of personal computers and work with general purpose programs, and involves research and / or innovation and is characterized by complexity and uncertainty requirements.

general:

1. The ability to apply knowledge of medical informatics in practical situations.

2. The ability to choose a communication strategy; ability to work in a team; interpersonal skills.

3. The skills of using information and communication technologies.

4. The ability to abstract thinking, analysis and synthesis, ability to learn and be modernly trained.

5. The ability to evaluate and ensure the quality of work performed.

6. The ability to acquire new knowledge and to be modernly educated, to be aware of the possibility of lifelong learning.

7. Recognition of moral and bioethical aspects of scientific research and the need for intellectual integrity, as well as professional codes of conduct.

special (professional):

1. The ability to process state, social, economic and medical information: under any circumstances, using standard procedures, including modern computer information technology.

2. Be able to determine the source and/or location of the required information depending on its type; receive the necessary information from a specific source; process and analyze the received information.

3. To demonstrate computer skills and search for biomedical data using information technology.

4. To identify opportunities for the use of information technology and computers in medicine.

5. To demonstrate skills methods of processing medical information.

6. To explain the principles of formalization and algorithmization of medical problems, the principles of modeling in biology and medicine.

1.3.2. The study of the discipline provides students with the acquisition of the following **program learning outcomes:**

PLO 1 Acquire knowledge sufficient to understand the basic physical characteristics of medical and biological systems and the physical basis of the processes, which are occurring in living organisms.

PLO 2 Be able to integrate basic knowledge of physics, chemistry, biology, mathematics, information technology to create a foundation of professional competencies.

PLO 3 Be able to collect, register and analyze data from biomedical research using appropriate methods and technological means.

PLO 4 Be able to apply quantitative methods in the study of medical and biological processes.

PLO 5 Be able to integrate basic knowledge of medical informatics in formation of the future pediatrician's competence in the field of digital technologies.

PLO 6 Be able to effectively use system and application software in the field of health care.

PLO 7 Be able to independently master general and medical software.

PLO 8 Be able to apply computer technologies of visualization and statistical analysis of data of medical and biological researches.

PLO 9 Be able to search and process data in specialized databases of evidence-based medicine;

PLO 10 Be able to develop decision support systems in medicine and pediatrics.

PLO 11 Be able to efficiently process medical data in a Web-oriented environment.

PLO 12 Be able to implement information processes in the field of health care, involving the use of digital technologies.

1.3.3. The study of the discipline provides students with the following Soft skills:

– basic concepts of the discipline (data, information, messages, message scheme, types and properties of information, coding of information, units of information, information carriers, information processes and their types, medical data, their types and properties, methods and digital tools of medical processing data, information technologies and their types, tools of information technologies, stages of development and evolution of information technologies);

– basic concepts of network technologies and telemedicine (computer network, classification of computer networks, topologies of local networks, global networks, data transmission protocols, TCP / IP protocol, IP-addressing, DNS-addressing, URL-address, Web-technologies and their characteristics, cloud technologies and cloud data processing, telemedicine, the main areas of application of telemedicine, methods of information protection, the principles of secure networking);

– concept of database and information resources of evidence-based medicine (database, database management systems (DBMS), DBMS architecture, data models (hierarchical, network, relational, object-oriented), stages of relational database design, programming language of structural queries SQL for working with databases, specialized databases of evidence-based medicine (Cochrane Library, Medline / Pubmed, Trip, etc.));

– basic concept of technologies of digital medical images and biosignals processing (basic concepts of digital image processing, analog and digital images, raster and vector digital images, color schemes, basic digital image storage formats, digital medical image, stages of digital medical image formation, methods of digital medical image production (computed tomography, magnetic resonance imaging, positron emission tomography, ultrasound, angiography, endoscopy, etc.), 2D, 3D, 4D digital image formats, medical standard for creating, storing, transmitting and visualizing digital medical images DICOM, DICOM-file, network DICOM-protocol, basic principles of work with DICOM Viewer and open source program ImageJ for analysis and processing of medical images, digital biomedical signals and methods of their reception (electrocardiography, rheography, electroencephalography, electromyography, audiometry, electrogastrography));

– basic concept of computer technologies which use for statistical analysis of medical research data processing (basic concepts of statistics, methods of descriptive statistics, correlation and regression analysis, methods of statistical testing of hypotheses);

– basic concept of computer technologies of modeling and decision support in biomedical research, practical medicine and pediatrics (model, types of models,

modeling, stages of modeling, basics of algorithmization, types and properties of algorithms, basic programming operators, expert systems and their types, personalized intelligent digital devices and systems, artificial intelligence, areas of application of robotics in medicine);

– basic concept of theory of medical information systems (information systems, medical information systems and their types, clinical use of information technologies, electronic medical card of the patient, electronic prescription, electronic signature).

2. INFORMATION SCOPE OF THE DISCIPLINE

Name of indicators	Field of knowledge, specialty, educational degree, EPP	Characteristics of the educational discipline	
		Full-time education	
Number of credits – 3,0	Field of knowledge: <u>22 «Health care»</u> (code and name)	normative	
Total number of hours – 90	Specialty: <u>221 «Dentistry»</u> (code and name)	Year of training (course):	
		2-nd	
		Semester	
		3-rd	
Hours for day (or evening) form of study: classroom - 40 self-study work – 50	Education degree: <u>the second (master's) level of higher education</u> EPP: <u>221 «Dentistry»</u>	Lectures	
		0 h.	
		Practical, seminar	
		40 h.	0 h.
		Laboratory works	
		0 h.	
		Self-study work	
50 h.			
Individual work: 0 h.			
Type of final control: credit			

2.1 Description of the discipline

2.2.1 Lectures

№	The name of topic	Number of hours	Types of lectures
Totally lecture hours		0	

2.2.2 Seminars

№	The name of topic	Number of hours	Teaching methods	Forms of control
1				
2				
	Total of hours		0	

2.2.3 Practical classes

№ 3/II	The name of topic	Number of hours	Teaching methods	Forms of control
1	Basic concepts of medical informatics. The computer in the future doctor's activity.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
2	Healthcare information resources.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
3	Creation and maintenance of medical records.	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
4	Construction of databases of medical institutions. Design and development of a clinical laboratory database.	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
5	Medical information systems. Creating a patient's electronic medical record (EMR).	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
6	Final current control №1.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.

7	Techniques of working with medical information by means of the Table processor.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
8	Methods of biostatistics. Statistical analysis of biomedical data.	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
9	Application of the method of cluster analysis for data processing of medical researches.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
10	Formal logic in solving problems of diagnostics, treatment and prevention of medical diseases.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
11	Decision-making methods and systems. Decision support through forecasting methods.	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
12	Computer-aided Mathematical Modeling in Biomedical Research.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
13	Multimedia presentation of biomedical data	4	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
14	Final current control №1.	2	explanatory-illustrative (information-receptive) method, reproductive, problem-solving method, partial-search (heuristic) method	Oral control, control of practical skills, test control.
Totally hours for practical classes		40		

2.2.4. Laboratory classes

№	The name of topic	Number of hours	Teaching methods	Forms of control
1				

2				
	Total of hours	0		

2.2.5. Self-study work

№ з/п	The name of topic	Number of hours	Teaching methods	Forms of control
1	Coding and classification.	5	reproductive, problem-solving method	self-control
2	Visualization of medical and biological Medical image processing and analysis.	5	reproductive, problem-solving method	self-control
3	Analysis of biosignals. Methods of processing biosignals.	5	reproductive, problem-solving method	self-control
4	Mathematical modeling in biology and medicine.	5	reproductive, problem-solving method	self-control
5	System analysis.	6	reproductive, problem-solving method	self-control
6	Cybernetics.	6	reproductive, problem-solving method	self-control
7	Formal logic in solving problems of diagnostics, treatment and prevention of diseases.	6	reproductive, problem-solving method	self-control
8	Expert systems in medicine	6	reproductive, problem-solving method	self-control
9	Decision making	6	reproductive, problem-solving method	self-control
	Total of hours	50		

3. EVALUATION CRITERIA

3.1. Evaluation of educational success of students are carried out on the basis of the current «Instructions for evaluating the educational activities of students of KhNMU», approved by the Order of KhNMU from 21.08.2021 №181.

Control of mastering the topic (current control) in practical classes are carried out in accordance with specific objectives with the use of entrance test control, oral examination and testing of practical skills.

After conducting the last practical lesson and grading in the electronic journal, the teacher calculates the average grade for the entire period of study of the discipline (on the traditional scale).

Recalculation of the average grade for the current activity into a multi-scale scale is carried out in accordance with the «Instruction on Evaluation of Training Activities under the European Credit Transfer System of the Organization of the Learning Process» (Table 1).

Table 1

**Recalculation of the average score for the current activity into a multi-scale scale
(for subjects completed by credit)**

4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale
5	200	4.22-4,23	169	3.45-3,46	138
4.97-4,99	199	4.19-4,21	168	3.42-3,44	137
4.95-4,96	198	4.17-4,18	167	3.4-3,41	136
4.92-4,94	197	4.14-4,16	166	3.37-3,39	135
4.9-4,91	196	4.12-4,13	165	3.35-3,36	134
4.87-4,89	195	4.09-4,11	164	3.32-3,34	133
4.85-4,86	194	4.07-4,08	163	3.3-3,31	132
4.82-4,84	193	4.04-4,06	162	3.27-3,29	131
4.8-4,81	192	4.02-4,03	161	3.25-3,26	130
4.77-4,79	191	3.99-4,01	160	3.22-3,24	129
4.75-4,76	190	3.97-3,98	159	3.2-3,21	128
4.72-4,73	189	3.94-4,00	158	3.17-3,18	127

4,74		3,96		3,19	
4.7-4,71	188	3.92-3,93	157	3.15-3,16	126
4.67-4,69	187	3.89-3,91	156	3.12-3,14	125
4.65-4,66	186	3.87-3,88	155	3.1-3,11	124
4.62-4,64	185	3.84-3,86	154	3.07-3,09	123
4.6-4,61	184	3.82-3,83	153	3.05-3,06	122
4.57-4,59	183	3.79-3,81	152	3.02-3,04	121
4.54-4,56	182	3.77-3,78	151	3-3,01	120
4.52-4,53	181	3.74-3,76	150	Less than 3	Not enough
4.5-4,51	180	3.72-3,73	149		
4.47-4,49	179	3.7-3,71	148		
4.45-4,46	178	3.67-3,69	147		
4.42-4,44	177	3.65-3,66	146		
4.4-4,41	176	3.62-3,64	145		
4.37-4,39	175	3.6-3,61	144		
4.35-4,36	174	3.57-3,59	143		
4.32-4,34	173	3.55-3,56	142		
4.3-4,31	172	3.52-3,54	141		
4,27-4,29	171	3.5-3,51	140		
4.24-4,26	170	3.47-3,49	139		

3.1.2. The individual tasks of the student (IT) are evaluated in points (not more than 10), which are added to the points scored at the end of the study of the discipline before the "test". Points for individual work are accrued to the student if he has

completely and qualitatively filled in his Workbook or performed other tasks proposed by the teacher in the discipline, and is a maximum of 10 points.

The total amount of points for IPA and SCI may not exceed 200 points.

The final control of mastering the material is carried out by the teacher in the form of writing by each student an individual written Test (25 test tasks), compiled on the topics of Practical classes. Criteria for evaluating the test:

- 15-19 correct answers - grade "3",
- 20-23 correct answers - grade "4",
- 24-25 correct answers - grade "5".

After writing the second test, the average score is calculated for two sections (on a traditional scale), which is converted into points on a 200-point scale (Table 1 "Guidelines for the evaluation of educational activities in the European credit transfer system of the educational process"). The teacher puts these points in the student's record book with the mark "**credit**" and fills in the Credit book of students in the discipline according with the form: U-5.03A - **credit**.

A student receives a mark "credit" to the record book if he scored from 120 to 200 points. Assessment of the discipline is given only to students who have completed all final tests. Students who have not completed the curriculum requirements are given a FX score if they have been admitted to the final test but have not passed it. Grade F is given to students who are not admitted to the final test.

3.1.3. Grade from the discipline

The grade in the discipline is defined as the sum of points for IPA and IPR and ranges from 120 to 200 points.

The correspondence of the scores on the 200-point scale according to the ECTS scale and to the four-point (national) scale is given in Table 2.

Table 2

Relevance of estimates on a 200 point scale, four-point (national) scale and ECTS scale

Score by 200 point scale	Score by ECTS scale	Score for four-point (national) scale
180–200	A	Excellent
160–179	B	Good
150–159	C	Good
130–149	D	Satisfactory
120–129	E	Satisfactory
Less 120	F	Unsatisfactory

Elimination of academic debt (working off)

Elimination of academic debt is carried out in the form of an oral interview of the student or writing a test task on the topic of the lesson. To work off the debt, the student can also prepare an essay or complete an individual task on a relevant topic.

3.2. Questions for control tests:

1. Definition of computer science as a science.
2. The concept of "information message", "data", "signal", "communication channel".
3. Measuring the amount of information.
4. The structure of a personal computer.
5. Personal computer software.
6. Operating systems and their classification.
7. The main components of computer networks.
8. Classification of computer networks.
9. Internet addressing: IP-address, domain name (DNS-address); URL.
10. Use of Internet services.
11. Principles of forming a search query.
12. General purpose search engines.
13. Specialized medical search systems.
14. Medical resources Internet.
15. The concept of the semantic triangle.
16. Definition of classification and its examples.
17. Types of codes: numerical, mnemonic, hierarchical, comparison codes.
18. Coding system MKH, DSM, SNOMED, ICPC.
19. Definition of formalization and algorithmization.
20. Types of algorithms: linear, branched, cyclic.
21. Centralized and distributed databases, hierarchical and network databases, specialized databases.
22. The main groups of technical devices used in medical diagnostics.
23. Describe the main components of diagnostic MAPC.
24. Types of noise and their influence on the definition of measured parameters.
25. The main categories of electrophysiological indicators.
26. Types of bioelectrical indicators of direct and indirect measurements.
27. Types of research conducted with the help of MAPC.
28. Information system, classification of MIS, their purpose.
29. Consulting and diagnostic systems and their types.
30. Medical hardware and software complexes, their classification.
31. Automated doctor's place.
32. Classification of MIS level of treatment and prevention facilities.
33. Electronic medical record, basic levels of computerization of medical history.
34. Classification of MIS territorial level.
35. The current situation in the field of information security.
36. Categories of information security: confidentiality, integrity, secrecy, protection, authenticity, appeal, reliability, accuracy, controllability, identification control.
37. Protection of medical information, the degree of protection of information (GIS) about patients.

38. Characteristics affecting information security.
39. Problems of protection of medical secrecy.
40. Classification of information security violations.
41. Modeling of GIS creation processes.
42. Workbook in MS Excel, its type.
43. Erroneous values in MS Excel.
44. Construction of charts (graphs) in MS Excel.
45. Use in medicine MS Excel.
46. Using MS Excel to process statistics.
47. Definition of general and sample populations.
48. Data types. Measurement scales.
49. Types of graphical description of data.
50. Distribution histogram. Algorithm for its construction.
51. Numerical characteristics of the general population: average, variance, standard deviation.
52. Parametric and nonparametric methods of statistics.
53. Statistical hypotheses.
54. Descriptive statistics for samples with a normal distribution law.
55. Descriptive statistics for samples with a distribution law other than normal.
56. Statistical functions for calculating descriptive statistics in the package LibreOffice Calc.
57. Types of relationships between variables. Statistical connection.
58. Correlation dependence. Pearson's linear correlation coefficient. Spearman's rank correlation coefficient.
59. Coefficient of determination in linear regression. Its relationship with the correlation coefficient.
60. Criteria for comparing the significance of the difference between the average of the two samples.
61. Student's criterion of comparisons of two means.
62. Mann-Whitney test to compare the two samples.
63. The main task of cluster analysis
64. Methods of cluster analysis, programs for clustering.
65. Spreadsheet technologies used in clustering.
66. Expert systems as a class of artificial intelligence systems. The specifics of the implementation of expert systems based on formal and informal logic.
67. The main criteria for the feasibility of creating expert systems.
68. The composition of a typical expert system.
69. Characteristic features of expert systems (field of application, design features, method of solving problems, etc.).
70. Logic inference machine. Direct and inverse logical inference.
71. Tools of expert systems.
72. Knowledge base of the expert system, static, dynamic, working knowledge. Source of knowledge of the expert system. Ways of obtaining knowledge by the system.
73. Basic models of knowledge representation: production, frames, semantic networks, logical, neural networks.

74. The use of expert systems in medicine.
75. Artificial neural networks (AR). Features of their work. Areas of application of NM.
76. Classification of NM, training of NM.
77. Expert systems (EC) as a class of artificial intelligence systems. The specifics of the implementation of expert systems based on formal and informal logic. criteria for the need to create expert systems.
78. Components of a typical EC, the characteristics of the EC (scope, design features, method of solving problems, etc.).
79. The machine of logical inference. Direct and inverse logical conclusion.
80. Tool devices EC.
81. EU knowledge base. Static, dynamic, working knowledge. Sources of EU knowledge. Ways to gain knowledge of the system.
82. Models of knowledge representation: production, frames, semantic networks, logical, neural networks.
83. The concept of approximation model, types of approximation models implemented in the spreadsheet LibreOffice Calc.
84. The concept of "forecast" and "forecasting", the accuracy of any forecast, the main sources of forecast errors.
85. The method of "gold standard" for diagnosis. Characteristics of sensitivity and specificity of the diagnostic test?
86. Definition of Bayes' theorem.
87. Data to assess the likelihood of disease in a positive test.
88. Types of modeling, degree of complexity and adequacy of the mathematical model.
89. Examples of energy, material, mathematical models in medicine.
90. Limitations and advantages of the method of mathematical modeling.
91. Model "predators - victims".
92. Description of the immunological model.
93. Description of the population growth model.
94. Description of the model of infection spread.
95. Multimedia technologies, categories of multimedia products, possibilities of multimedia technologies.
96. Multimedia in medicine, multimedia program "LibreOffice Impress".

3.3. Control questions:

1. The concept of "information message", "data", "signal", "communication channel".
2. Measuring the amount of information.
3. Operating systems and their classification.
4. Internet addressing: IP-address, domain name (DNS-address); URL.
5. Principles of forming a search query.
6. General purpose search engines.
7. The concept of the semantic triangle.
8. Definition of classification and its examples.
9. Types of codes: numerical, mnemonic, hierarchical, comparison codes.

10. Coding system MKH, DSM, SNOMED, ICPC.
11. Definition of formalization and algorithmization.
12. Types of algorithms: linear, branched, cyclic.
13. Describe the main components of diagnostic MAPC.
14. Types of bioelectrical indicators of direct and indirect measurements.
15. Consulting and diagnostic systems and their types.
16. Medical hardware and software complexes, their classification.
17. Automated doctor's place.
18. Classification of MIS level of treatment and prevention facilities.
19. Electronic medical record, basic levels of computerization of medical history.
20. Classification of MIS territorial level.
21. Categories of information security: confidentiality, integrity, secrecy, protection, authenticity, appeal, reliability, accuracy, controllability, identification control.
22. Protection of medical information, the degree of protection of information (GIS) about patients.
23. Characteristics affecting information security.
24. Classification of information security violations.
25. Modeling of GIS creation processes.
26. Construction of charts (graphs) in MS Excel.
27. Definition of general and sample populations.
28. Data types. Measurement scales.
29. Numerical characteristics of the general population: average, variance, standard deviation.
30. Parametric and nonparametric methods of statistics.
31. Statistical hypotheses.
32. Descriptive statistics for samples with a normal distribution law.
33. Descriptive statistics for samples with a distribution law other than normal.
34. Types of relationships between variables. Statistical connection.
35. Correlation dependence. Pearson's linear correlation coefficient. Spearman's rank correlation coefficient.
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57. Models of knowledge representation: production, frames, semantic networks, logical, neural networks.
58. The concept of approximation model, types of approximation models implemented in the spreadsheet LibreOffice Calc.
59. The method of "gold standard" for diagnosis. Characteristics of sensitivity and specificity of the diagnostic test?
60. Definition of Bayes' theorem.
61. Data to assess the likelihood of disease in a positive test.
62. Types of modeling, degree of complexity and adequacy of the mathematical model.
63. Examples of energy, material, mathematical models in medicine.
64. Model "predators - victims".
65. Description of the immunological model.
66. Description of the population growth model.
67. Description of the model of infection spread.

3.4 Individual tasks (the list approved at the meeting of the department with the determination of the number of points for their performance, which can be added as incentives):

To organize individual work of students, it is recommended to use methodical materials in the form of personal workbooks of students for classroom and extracurricular work, developed by teachers of the Department of Medical and Biological Physics and Medical Informatics of KhNMU.

Completion of test tasks and problem solving by students in a personal workbook allows teachers to score additional points for individual work of students.

Students also have the opportunity to perform individual work under the guidance of a teacher on one of the selected topics in the form of an abstract. They can also get extra points for this work.

The total maximum number of additional points for individual work of students is 10 points (according to the "Instructions for the evaluation of educational activities in

the European credit transfer system of the educational process", the evaluation of individual tasks of the student).

3.5. Rules for appealing the assessment

If the student does not agree with the grade obtained in class, he can appeal it. In this case, the student's knowledge will be assessed by a commission consisting of head of the department, an independent teacher and a teacher of the group in which the student is studying. To increase the grade, the group teacher may also ask the student to write an essay or complete an individual task on a chosen topic.

4. DISCIPLINE POLICY

Discipline requirements (system of requirements and rules that the teacher imposes on students of higher education when studying the discipline)

For successful mastering of the discipline it is necessary that the student of higher education systematically prepares for practical classes, performs the tasks offered for mastering the topics recommended for self-study, reads the recommended literature, takes an active part in discussing the topic in class.

Attendance and behavior (inadmissibility of absences, delays, clothing requirements, medical examination, etc.).

Attendance at practical classes in the discipline is mandatory (except for good reasons). A class missed by a student for any reason must be completed. It is unacceptable to be late for class. By the time the class begins, the student must be dressed in a medical gown. During the lesson you can not eat or drink, chew gum, contaminate the surfaces of classrooms. When communicating with the teacher and others, the student must be polite, talk quietly and behave calmly.

Use of electronic gadgets.

The use of any electronic gadgets (smartphones, watches, tablets, laptops, etc.) throughout the lesson is strictly prohibited. If the teacher sees that the student violates this requirement, he can remove the student from the classroom and put him "absent".

5. ACADEMIC INTEGRITY

Adherence to academic integrity by the student provides:

independent performance of educational tasks, tasks of current and final control of learning outcomes; references to sources of information in the case of the use of ideas, statements, information; compliance with copyright law; providing reliable information about the results of their own educational (scientific, creative) activities. Academic plagiarism, writing off, deception, falsification, etc. are considered violations of academic integrity.

For violation of academic integrity, students may be held subject to the following academic liability: re-assessment (test, exam, test, etc.); re-taking the training course; deductions from the educational institution.

Policy for people with special educational needs

For persons with special needs, the requirement of academic integrity is applied taking into account their individual needs and capabilities.

Recommendations for successful completion of the discipline (activity of higher education students during practical classes, fulfillment of the required minimum of educational work)

To successfully complete the discipline, the applicant must complete the required minimum of academic (classroom and independent) work specified in the curriculum of the discipline. When assessing the lesson is also taken into account diligence, accuracy of the student, activity in discussing the topic, speed and creativity of thinking, perseverance in learning.

Encouragement and penalties (additional points for conferences, research, edits, advice, participation in surveys)

To encourage students who are particularly active and persistent in their studies, they are awarded additional points for participating in scientific conferences, research, surveys, etc. For violation of discipline (rules of conduct, uniforms, etc.) and academic integrity during classes, the student may be subject to penalties - removal from the class, re-assessment (test, exam, test, etc.); re-taking the training course; deductions from the educational institution.

Safety precautions

During the lesson, the student must follow the rules of life safety.

When conducting laboratory work or practical classes, it is necessary to follow the rules of fire safety, students need to know the location of the primary means of fire extinguishing (fire extinguisher, capes made of fire-retardant fabric, sand).

In the event of an accident, the victim or eyewitness must immediately notify the teacher. If equipment, computers, fixtures and tools malfunction, stop working and notify the instructor.

During the class, students must follow the order of laboratory work and practical classes, the rules of personal hygiene, remove foreign objects from the workplace and ensure its cleanliness.

It is not recommended to leave unattended electrical appliances and devices, including computers. If malfunctions are found in the operation of electrical devices that are under voltage, their increased heating, sparks, the smell of burnt insulation, smoke, immediately stop work, turn off the power supply and notify the teacher.

Procedure for informing about changes in the syllabus:

the necessary changes in the syllabus are approved by the methodical commission of KhNMU on the problems of natural science training and are published on the site of KhNMU, the site of the department of medical and biological physics and medical informatics of KhNMU.

6. RECOMMENDED LITERATURES

Basic

1. Медична інформатика: навчальний посібник для студентів медичних університетів / В. Г. Книгавко, О. В. Зайцева, М. А. Бондаренко, Л. В. Батюк, О. С. Рукін. – Харків : ХНМУ, 2019. – 65 с.
2. Medical informatics: tutorial for foreign English-speaking students of medical universities / V. G. Knigavko, O. V. Zaytseva, M. A. Bondarenko, L. V. Batyuk, A. S. Rukin. – Kharkov : KhNMU, 2019. – 60 p.
3. Радзішевська Є. Б. Інформаційні технології в медицині. E-health: підручник для студентів медичних закладів вищої освіти / Є. Б. Радзішевська, О. В. Висоцька ; за ред. В. Г. Книгавка ; Харківський національний медичний університет. – Харків : ХНМУ, 2019. – 72 с.
4. David J. Lubliner. Biomedical Informatics: An Introduction to Information Systems and Software in Medicine and Health // Auerbach Publications. 2015. – 434 p.
5. Nanette B. Health Information Management Technology: An Applied Approach 5th ed. Edition // American Health Information Management Association. 2016. – 686 p.
6. Abdelhak Mt. Health Information: Management of a Strategic Resource, 5th Edition / M. Abdelhak, M. A. Hanken // Saunders; 5 edition 2015. – 800 p.

Auxiliary

1. Медична інформатика : підручник для студентів медичних ВНЗ / за ред. В. Г. Книгавка. – Харків. ХНМУ. 2015. – 240 с.
2. Hebda T.L. Handbook of Informatics for Nurses & Healthcare Professionals (5th Edition) / T. L. Hebda, P. Czar // Kindle Edition. 2012. – 624 p.
3. Handbook of Medical Informatics. J.H. Editors, V. Bommel, M.A. Musen // Electronic resource: <http://www.mieur.nl/mihandbook>; <http://www.mihandbook.stanford.edu>
4. Mark A., Musen B. Handbook of Medical Informatics // Електронний ресурс: <ftp://46.101.84.92/pdf12/handbook-of-medical-informatics.pdf>

7. INFORMATION RESOURCES

1. **Link to the discipline page in MOODLE**
<http://31.128.79.157:8083/course/view.php?id=777>
2. <http://repo.knmu.edu.ua/handle/123456789/162>
<http://repo.knmu.edu.ua/handle/123456789/16713>

8. OTHER

WARNING! In this section, it is possible to provide information that the teacher deems necessary to add to the syllabus.

To the methodological support of elective disciplines add: business card of the discipline for its presentation to students (presentation, short description, banner of the discipline, video annotation)

Useful links:

Provisions on prevention, prevention and settlement of cases related to sexual harassment and discrimination in KhNMU

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog-sex.doc

Regulations on Academic Integrity and Ethics of Academic Relations at Kharkiv National Medical University

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_ad_etyka_text.pdf

The order of conducting classes on in-depth study by students of Kharkiv National Medical University of certain disciplines beyond the scope of the curriculum

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/nak-poriad-pogl-vyv-dysc.docx

Regulations on the Commission on Academic Integrity, Ethics and Conflict Management of KhNMU

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_komis_ad_text.pdf

Regulations on the recognition of the results of non-formal education at Kharkiv National Medical University

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_neform_osv.pdf

INCLUSIVE EDUCATION:

http://www.knmu.kharkov.ua/index.php?option=com_content&view=article&id=7108%3A2021-03-10-14-08-02&catid=12%3A2011-05-10-07-16-32&Itemid=33&lang=uk

ACADEMIC INTEGRITY:

http://www.knmu.kharkov.ua/index.php?option=com_content&view=article&id=2520%3A2015-04-30-08-10-46&catid=20%3A2011-05-17-09-30-17&Itemid=40&lang=uk

http://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/kodex_AD.docx