MINISTRY OF HEALTH OF UKRAINE
KHARKIV NATIONAL MEDICAL UNIVERSITY

Department of Medical and Biological Physics and Medical Informatics
Academic year: 2023-2024

SYLLABUS OF THE EDUCATIONAL COMPONENT

«MEDICAL EXPERT SYSTEMS»

Normative or selective educational component selective

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

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

Major field 223 " Nursing"
(code and name of the specialty)

Educational professional program Nursing

The first (bachelor's) level of higher education **4 years of study**

Year: 3

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

prof. S.O. Krasnikova

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Surname, first name, patronymic, position, academic title, scientific degree	Yevgenia Radzishevska, associate professor of the department, associate professor, candidate of physical and mathematical sciences
Professional interests, link to the teacher's profile (on the website of the university, the department, in the Moodle system, etc.	Medical and biological physics; medical informatics
Contact phone number	https://knmu.edu.ua/departments/kafedra-medychnoyi-ta-biologichnoyi-fizyky-i-medychnoyi-informatyky/
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Surname, first name, patronymic, position, academic title, scientific degree	According to the schedule of the educational process
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Teacher's corporate mail	Solodovnikov Andrii Serhiyovych, associate professor of the department, associate professor, candidate of technical sciences
Consultations	
Location	
Surname, first name, patronymic, position, academic title, scientific degree	Medical informatics
Professional interests, link to the teacher's profile (on the website of the university, the department, in the Moodle system, etc.	Medical informatics https://knmu.edu.ua/departments/kafedra-medychnoyi-ta-biologichnoyi-fizyky-i-medychnoyi-informatyky/
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INTRODUCTION

The syllabus of the educational component "Medical expert systems" is drawn up in accordance with the educational and professional program (hereinafter referred to as "Nursing") and the Standard of Higher Education of Ukraine (hereinafter referred to as the Standard), the first (bachelor's educational and scientific) level of higher education, field of knowledge 22 " Health care", specialty 223 "Nursing".

Description of the educational component (abstract). The educational component "Medical expert systems" is taught with the aim of familiarizing students with higher education with the issues of intelligent medical decision support systems as an integral component of E-health, issues of the theory of decision-making in medicine and the creation of medical knowledge bases. The educational component "Medical expert systems" is optional.

The subject of study of the educational component "Medical expert systems" is the information processes of the health care industry in the conditions of the development of the electronic health care system.

Interdisciplinary connections. The study of the educational component "Medical expert systems" is based on the assimilation of educational components in the fields of medical informatics, medical and biological physics; medical information technologies.

Prerequisites The study of the educational component "Medical expert systems" involves the prior learning of the basic components of medical informatics.

Post-requisites. The main provisions of the educational component "Medical expert systems" should be applied when studying professional educational components.

Link to the page of the educational component "Medical expert systems" in MOODLE https://distance.knmu.edu.ua/course/view.php?id=5087

1. PURPOSE AND TASK OF THE EDUCATIONAL COMPONENT

1.1 The purpose of teaching the educational component "Medical expert systems" is the formation and development of future specialists' competence in the field of decision-making processes in the medical industry; approaches to assessing the effectiveness of a diagnostic test; automated medical decision support systems, the basics of an intellectual approach.

1.2 The main tasks of the educational component "Medical expert systems" are the acquisition by the students of education of competencies in accordance with the general and professional competencies of the educational and professional program "Nursing" of the first (bachelor's) level of higher education in the specialty 223 Nursing.

1.3. Competencies and learning outcomes, the formation of which is facilitated by the educational component (relationship with the normative content of the training of higher education applicants, formulated in terms of learning outcomes in the OPP and the Standard):

1.3.1. The study of the educational component "Medical expert systems" ensures that students acquire the following competencies:
- *integral:*
the ability to solve typical and complex specialized tasks and practical problems in professional activities in the field of health care or in the process of learning, which involves conducting research and/or implementing innovations and is characterized by the complexity and uncertainty of conditions and requirements.
- *general:*
ability to abstract thinking, analysis and synthesis; the ability to apply knowledge in practical activities; skills in using information and communication technologies; the ability to search, process and analyze information from various sources; ability to adapt and act in a new situation; ability to work in a team; the ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.
- *special (professional, subject):*
ability to process and analyze professional information from various sources; the ability to determine the possibilities of using information technologies and PCs in medicine; the ability to use methods of processing medical information; the ability to evaluate the role of new information and communication technologies in professional activity; the ability to independently master software tools of various purposes and to update and integrate acquired knowledge.

1.3.2. The study of the educational component "Medical expert systems" ensures that the students acquire the following learning outcomes:
PLO 2. Carry out nursing diagnosis: identify and assess the patient's problems. In the conditions of health care facilities, at home, predictable circumstances, to be able to identify the real problems of the patient, assess their priority and establish a nursing diagnosis.
PRN 4. Monitor the work of junior medical staff and the state of inventory. In the conditions of health care facilities, in accordance with job duties, in order to comply with the sanitary and anti-

epidemic regime, be able to:
- conduct training of junior medical personnel on the performance of functional duties and occupational health and safety;
- monitor compliance with safety rules by junior medical personnel;
- monitor the work of junior medical personnel; control the implementation of the rules of the internal procedure by staff and patients;
- monitor compliance with measures of sanitary and hygienic regime in wards and medical offices.
PLO 14. To be able to prepare the patient, collect and direct biological material for laboratory and instrumental research.
PLO 20. Appropriate medical documentation should be maintained.
1.3.3. The study of the educational component "Information technologies in medicine" ensures that students of higher education acquire the following social skills (soft skills):
communicativeness (implemented through: the method of working in groups and brainstorming during analysis, clinical cases, the method of presenting the results of independent work and defending them in a group),
teamwork (implemented through: group work method and brainstorming during analysis, clinical cases),
conflict management (implemented through: business games),
time management (implemented through: self-organization method during classroom work in groups and independent work),
leadership skills (implemented through: a method of presenting the results of independent work and defending them in a group).

2. INFORMATION VOLUME OF THE EDUCATIONAL COMPONENT "MEDICAL EXPERT SYSTEMS"

<table>
<tr><td rowspan="2">Name of indicators</td><td rowspan="2">Field of knowledge, direction of training, educational and qualification level</td><td>Characteristics of the educational component</td></tr>
<tr><td>full-time of education</td></tr>
<tr><td>The number of credits is 3.0</td><td>Branch of knowledge
22 Health care
(code and name)</td><td>selective</td></tr>
<tr><td rowspan="4">The total number of hours is 90</td><td rowspan="4">Specialty:
223 Nursing</td><td>Year of preparation:</td></tr>
<tr><td>3-rd</td></tr>
<tr><td>Semester</td></tr>
<tr><td></td></tr>
<tr><td rowspan="8">Hours for full-time study:
classrooms - 36
independent work - 54</td><td rowspan="8">Education level:
The first (bachelor) level of higher education</td><td>Lectures</td></tr>
<tr><td>0 hours</td></tr>
<tr><td>Practical</td></tr>
<tr><td>36 Hours</td></tr>
<tr><td>Independent work</td></tr>
<tr><td>54 hours</td></tr>
<tr><td>Individual tasks:</td></tr>
<tr><td>0 hours</td></tr>
<tr><td>Type of control:
credit</td></tr>
</table>

2.1 Description of the educational component

2.2.1 Lectures

№ з/п	Topic name	Number hours	Types of lectures
Total lecture hours		0	

2.2.2 Seminar classes

№	Topic name Quantity	Topic name Quantity	Topic name Quantity	Topic name Quantity
	Hours in general	**0**		

2.2.3 Practical classes

№ з/п	Topic name	Quantity hours	Methods learning	Forms control
1.	The main stages of the evolution of medical information systems	2		Test control (Moodle platform)
2.	Administrative medical information systems	2		
3.	Clinical medical information systems	2		
4,5	Electronic health care (E-health) as a new branch of social development. Basic principles of E-health development in Ukraine.	4	presentation on the platform google meet story-explanation, conversation	
6,7	Electronic medical record as an important part of the central component of E-health.	4		
8,9	Information access rights and protection of medical data. Protection of information in medical information systems.	4		
10,11	Decision-making theory as a science.	4		
12,13	The apparatus of characteristic curves as a tool for evaluating the quality of medical diagnostic technologies.	4		
14,15	Expert systems as a component of artificial intelligence systems.	4		
16	Examples of modern medical expert systems.	2		
17.	Knowledge acquisition strategies. Communicative and textological methods of extracting knowledge. Structural diagram of knowledge extraction.	2		
18	**Total hours of practical classes**	2	Test control (Moodle platform)	
Total hours		**36**		

2.2.4. Laboratory classes

№	Topic name Quantity	Topic name Quantity	Topic name Quantity	Topic name Quantity
1				
	Total hours	**0**		

2.2.5. Independent work

№	Topic name	Number	Number	Number
1	MIS of the basic level, their purpose. Information and reference MIS. Medical advisory and diagnostic systems. Medical hardware and software complexes. Automated doctor's workplace. Basic level systems for patients. MIS of advisory centers. Information banks of medical institutions and services. Personalized registers (databases and data banks). Electronic medical records as representatives of personalized registers.	5	electronic information	test control as a component of final control (Moodle platform)
2	Screening systems, their purpose. Information systems of medical and preventive institutions, their main representatives. Hospital information systems. Main components of GIS. MIS for research institutes and universities. Administrative and management MIS. Statistical MIS for working with aggregated information by territory. MIS of specialized services and directions. Computer telecommunication networks.	5		
3	Concepts of health care informatization, patient-oriented tactics. The priority of the electronic form of working with data. The principle of one-time input and multiple use of data in information systems. Computer technologies for processing "big data" (Big Data).	5		
4	Modern assets in the processes of creating E-health in Ukraine. Integrated electronic medical record as an important part of the central component of E-health. Five levels of computerization of medical history. Advantages of using an electronic medical card.	5		
5	Electronic medical archive. Integrated electronic medical archive. Personal electronic medical archive. Electronic medical records management system. The structure of the electronic personal medical record. Life cycle of electronic	5		

	personal medical records.		electronic information	test control as a component of final control (Moodle platform
6	Hardware tokens. The request-response method. USB tokens. Smart cards. Types of smart cards. Barcode as a means of identification. iButton devices. Biometric identification systems (by fingerprint, ear shape, facial geometry, facial skin temperature, keyboard handwriting, palm print, palm vein pattern, retinal structure, iris pattern, signature and voice).	5		
7	Cryptography as a science. Encryption. Types of cryptographic systems (symmetric and asymmetric). Electronic digital signature. Use of digital signature in MIS.	5		
8	Decision making as a process of choosing some set of alternatives. The main stages of the decision-making process. Consequence of decision making. System of benefits. A solution is a set of alternatives that satisfy the rules of the system of preferences. Classification of decision-making problems. The person making the decision. 5	5		
9	Technology of construction of characteristic ROS-curves. Concept of insensitivity and non-specificity. The type of ROS curve depending on the quality of the test. The use of the ROC-curves apparatus to justify the reliability of automated diagnostic systems. 5	5		
10	Knowledge representation models as one of the most important areas of research in the field of artificial intelligence. Logical, production semantic and models based on the apparatus of frames. Expert and knowledge engineer as central figures for the formation of the knowledge base. 4	4	electronic information	test control as a component of final control (Moodle platform
11	Communicative and textological methods of extracting knowledge. Structural diagram of knowledge extraction. Active and passive communication methods. Observation, analysis of "think aloud" protocols, and lectures are the main types of passive knowledge extraction methods. The main active individual methods of extracting knowledge are questionnaires, interviews, free dialogue, games with an expert. Logic	5		

	of questions. The main active group methods of extracting knowledge (role games; round table discussions with the participation of several experts; brainstorming). Business game. Diagnostic game for diagnosis of decision-making methods in medicine (diagnosis of diagnostic methods). Individual and group games. Games using special equipment. Games with the use of computer technology.			
Total hours of independent work		**54**		

3. EVALUATION CRITERIA OF THE EDUCATIONAL COMPONENT

3.1.1 The evaluation of the educational success of education seekers is carried out on the basis of the current "Instructions for evaluating the educational activity of education seekers of the Khznyu University".

Control methods:

Oral and written control of mastering the topic is carried out in practical classes.

Control of the acquisition of practical abilities and skills is carried out in practical classes by the method of observation.

Control of the performance of independent work is carried out in writing (the written form involves presentation in both paper and/or electronic form) and oral form.

Current control is carried out at each practical session in accordance with the specific objectives of the topic. Types of standardized control of theoretical training and control of the acquisition of practical skills are used in all practical classes: computer tests, performance of practical tasks, including competence-oriented ones.

Final control involves the use of computer tests on the MOODLE remote platform to check the level of theoretical knowledge and the formation of practical skills in the process of performing a practical task on the computer.

The assessment for each practical lesson from the optional educational component is comprehensive, including the control of theoretical and practical training of the student of higher education, is given by the teacher according to the traditional four-point scale in the ASU, which is then converted into the corresponding points.

Evaluation criteria of the final control on the remote MOODLE platform.

The final control contains 25 questions, including:

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

Evaluation of the current educational component (CEC):

After conducting the last practical lesson and posting the grade in the electronic journal, the ASU calculates the student's average score for the year, and if there is no academic debt / missing a lesson, a credit is issued. The recalculation of the average grade for the current activity into a multi-point scale is carried out in the ACS in accordance with the "Instructions for evaluating the educational activity of students of KhNMU", approved by KhNMU Order No. 181 dated 08/21/2021. (Table 1)

Table 1

Recalculation of the average grade for the current activity in a 200-point scale (for the educational component that ends with credit)

4-point scale 200-point scale	4-point scale 200-point scale	4-point scale 200-point scale	4-point scale 200-point scale	4-point scale 200-point scale	4-point scale 200-point scale
5	200	4.3-4,31	172	3.6-3,61	144
4.97-4,99	199	4,27-4,29	171	3.57-3,59	143
4.95-4,96	198	4.24-4,26	170	3.55-3,56	142
4.92-4,94	197	4.22-4,23	169	3.52-3,54	141
4.9-4,91	196	4.19-4,21	168	3.5-3,51	140
4.87-4,89	195	4.17-4,18	167	3.47-3,49	139
4.85-4,86	194	4.14-4,16	166	3.45-3,46	138
4.82-4,84	193	4.12-4,13	165	3.42-3,44	137
4.8-4,81	192	4.09-4,11	164	3.4-3,41	136
4.77-4,79	191	4.07-4,08	163	3.37-3,39	135
4.75-4,76	190	4.04-4,06	162	3.35-3,36	134
4.72-4,74	189	4.02-4,03	161	3.32-3,34	133
4.7-4,71	188	3.99-4,01	160	3.3-3,31	132
4.67-4,69	187	3.97-3,98	159	3.27-3,29	131
4.65-4,66	186	3.94-3,96	158	3.25-3,26	130
4.62-4,64	185	3.92-3,93	157	3.22-3,24	129

4.6-4,61	184		3.89-3,91	156	3.2-3,21	128
4.57-4,59	183		3.87-3,88	155	3.17-3,19	127
4.54-4,56	182		3.84-3,86	154	3.15-3,16	126
4.52-4,53	181		3.82-3,83	153	3.12-3,14	125
4.5-4,51	180		3.79-3,81	152	3.1-3,11	124
4.47-4,49	179		3.77-3,78	151	3.07-3,09	123
4.45-4,46	178		3.74-3,76	150	3.05-3,06	122
4.42-4,44	177		3.72-3,73	149	3.02-3,04	121
4.4-4,41	176		3.7-3,71	148	3-3,01	120
4.37-4,39	175		3.67-3,69	147	Less than 3 h	Not enough
4.35-4,36	174		3.65-3,66	146		
4.32-4,34	173		3.62-3,64	145		

3.1.2. Evaluation of individual tasks of education seekers.

Not provided by the curriculum.

3.1.3. Evaluation of the educational component.

The grade from the selective educational component is determined by points for the POK and ranges from 120 to 200 points.

Correspondence of grades on a 200-point scale according to the ECTS scale and to a four-point scale is shown in Table 2.

Table 2

Correspondence of grades on a 200-point scale to the ECTS scale and to a four-point (national) scale

Rating	Rating	Rating
180–200	A	Perfectly
160–179	B	Fine
150–159	C	Fine
130–149	D	Satisfactorily
120–129	E	Satisfactorily
Меньше 120	F, Fx	Unsatisfactorily

An education seeker receives the mark "enrolled" in the record book if he scored from 120 to 200 points.

3.2. Questions for credit

Not provided for in the curriculum

3. 3. Questions for the final control

1. Medical information systems (MIS).
2. Electronic health care (E-health).
3. E-health tasks, which are solved by involving EHOZ.
4. Law of Ukraine "On Protection of Personal Data". Scope of the Law.
5. MIS as a component of E-health.
6. Problems of medicinal secrecy in the development of MIS.
7. Main categories of information security.
8. Definition of information protection.
9. Areas of use of decision-making theory as an interdisciplinary field of research.
10. Directions of application of decision-making approaches in medicine.
11. Decision-making as a process of choosing some set of alternatives.
12. Diagnostics as one of the most typical areas of decision-making for a doctor.
13. Use of alternative evaluations for comparative evaluation of the effectiveness of diagnostic tests.
14. Sensitivity and specificity as numerical characteristics of the test with an alternative research method.
15. Expert systems as a component of artificial intelligence systems.
16. Prospects for the integration of expert systems and the electronic medical record.
17. Expert systems based on scientific knowledge.
18. Expert systems are based on data.
19. Knowledge bases as the core of expert systems.
20. Knowledge representation models as one of the most important areas of research in the field of artificial intelligence.
21. Logical, production semantic and models based on the apparatus of frames.
22. Knowledge expert and engineer as central figures for the formation of the knowledge base.
23. Objective difficulties of extracting knowledge.
24. The process of acquiring knowledge. Objective, subjective and empirical knowledge.
25. Communicative and textological methods of extracting knowledge. Structural diagram of knowledge extraction.
26. Active and passive communication methods.
27. General structure of active methods.
28. General structure of passive knowledge extraction methods.
29. Game methods.
30. Observations.
31. Questionnaire.

3.4. Individual tasks

Not provided for in the curriculum.

3.5. Rules for challenging the assessment

If the student of higher education does not agree with the grade received during the class, he can appeal it. In this case, the knowledge of the student of higher education will be evaluated by a committee consisting of the head or head of the department, an independent teacher and the teacher of the group in which the student of higher education studies. To increase the grade, the teacher of the group may also offer to write an essay or complete an individual task on a chosen topic.

4. POLICY OF DISCIPLINE

For the successful mastery of the discipline, it is necessary for the student of higher education to systematically prepare for practical classes, perform the tasks offered for mastering the topics recommended for independent study, read the recommended literature, and take an active part in discussing the subject of the class in the classroom.

Attending practical classes in the discipline is mandatory (except for good reasons). A class missed by a student of higher education for any reason must be completed. It is unacceptable to be late for classes. By the time the class begins, the student of higher education must change into a medical gown. When communicating with the teacher and surrounding students of higher education, one should show courtesy, speak quietly and behave calmly.

5. ACADEMIC INTEGRITY

Observance of academic integrity by the student of education involves:

independent performance of educational tasks, tasks of current and final control of learning results; references to sources of information in the case of using ideas, statements, information; compliance with copyright legislation; providing reliable information about the results of one's own educational (scientific, creative) activities. Academic plagiarism, plagiarism, cheating, falsification, etc. are considered violations of academic integrity.

For violation of academic integrity, students may be held to the following academic responsibility: retaking the assessment (test, exam, credit, etc.); repeated completion of the training course; deduction from the educational institution.

6. RECOMMENDED LITERATURE

Basic

1. Handbook of Biomedical Informatics
2. Electronic resource:https://en.wikipedia.org/wiki/Book:Handbook_of_Biomedical_Informatics
3. E.H. Shortiffe. Biomedical Informatics: Computer Applications in Health Care and Biomedicine 4-th edition / Edward H. Shortiffe, James J. Cimino // New York: Springer. 2019. – 1037 p.

4. Electronic resource:https://books.google.ro/books?id=Wn-fFVuUguMC&printsec=frontcover&dq=medical+informatics&hl=ru&sa=X&ved=0ahUKEwis8v2jyvHaAhXBhSwKHQSNBVcQ6AEIWDAH#v=onepage&q=medical%20informatics&f=false
5. Updated model of training of nurses / Isaeva O.S./ Theory and methodology of professional education // Issue 12. Vol. 1. 2019.- P.98-101

Auxiliary

1. Medical informatics: textbook. for medical students University /under the editorship of V. G. Bookcase – Kharkiv: KhNMU, 2015. – 288 p.
2. Ministry of Health of Ukraine. The concept of health care informatization. – Access mode: http://moz.gov.ua/article/reformplan/jak-bude-rozvivatisja-enealth-v-ukraini-prezentuvali-proekt-koncepciiinformatizacii-ohoroni-zdorovja
3. On the necessity of familiarizing students of higher medical educational institutions with the ISRS-2 coding system / E. B. Radzishevska, O. V. Vysotska, S. S. Grankina, and others. // Topical issues of higher medical education in Ukraine (with remote connection of the Ministry of Health of Ukraine by means of video conference communication): materials of the XV Vseukr. science and practice conf. from international with participation (Ternopil, May 17–18, 2018) / Ternopil. state honey. University named after I. Ya. Gorbachevsky.

7. INFORMATION RESOURCESП

Link to the page of the educational component in the MOODLE system: https://distance.knmu.edu.ua/course/view.php?id=5087
Page of the department of medical and biological physics and medical informatics on the university website:https://knmu.edu.ua/departments/kafedra-medychnoyi-ta-biologichnoyi-fizyky-i-medychnoyi-informatyky/

Section of the Department of Medical and Biological Physics and Medical Informatics in the Repository of the Khnru National Medical University: http://repo.knmu.edu.ua/handle/123456789/162.

8. OTHER

Regulations on academic integrity and ethics of academic relations at the Kharkiv National Medical Universityhttp://files.knmu.edu.ua:8181/upload/redakt/doc_uchproc/polog_ad_etyka_text.pdf
The procedure for conducting classes on in-depth study by students of the Kharkiv National Medical University of individual 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 the 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 the 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 HONESTY: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