Medical Informatics. Methodical recommendations for students

MODULE 1.
THEMATIC MODULE 1.
THEME 1. Safety measures. Objectives of the course. Structure of the course. Data and information. Data processing with the help of electronic spreadsheets. EXCEL application software.

Objective (general): To acquire basic skills of using MS Excel tools in sloving spreadsheet and calculation tasks.

Specific objectives:	The result knowledge and skills level:
1. To understand how modern packages of spreadsheet information processing are used for data operating and calculations. 2. To acquire skills of working with MS Excel spreadsheet.	1. To understand and to know how spreadsheets can be created and calculations made with the use of mathematic functions. 2. To demonstrate the acquired skills by forming a prescription list by time.

Stages of the lesson:

I. Studying the opportunities of packages of data processing in spreadsheet and use of MS Excel spreadsheet means.

II. Performing practical part of the laboratory work in accordance with the manual "The Basics of Medical Informatics", given out to students at the lesson. Learning theoretical information as to work in spreadsheet processor:

1. What advantages does MS Excel have compared to other electronic spreadsheets?
2. What kind of data can a cell contain?
3. How are the data aligned in the cell (on default)?
4. What is address of the cell?
5. What is absolute and relative address of the cell?
6. What is the difference between absolute and relative address of the cell?
7. What is a block of cells?
8. How can size of rows and columns be changed?
9. What happens if formulae are copied in Excel, if there is:

a) absolute reference to the cell;
b) relative reference to the cell?

10. How can several cells be merged in Excel?
11. What is formula line?
12. What are basic rules of formula entering in Excel?
13. What is called a "Function" in Excel?
14. How can a number be raised in Excel?

III. At the end of the lesson the laboratory work is summarized, the student demonstrates the spreadsheet he created on the display and explains how the tools of MS Excel were used for

spreadsheet and data operating. General level of students' knowledge and skills is controlled in form of written test.
IV. Marks, received by the students, as well as theme of the next lesson are announced.

MODULE 1.
THEMATIC MODULE 1.
THEME 2. Medical informatics as a science.

Objective (general): To interpret basic notions of informatics as a science. To know particular features of application software for information processing.	
Specific objectives:	**The result knowledge and skills level:**
1. To know basic categories and definitions used by informatics.	1. To know where in medicine informational technologies and PC can be applied.
2. To clearly understand technical basis of informatics and link between its elements.	2. To know how to apply the principles of formalization and algorithmization of medical data in medical practice.

I. The initial level of students' knowledge is determined at the beginning of the lesson in form of written test based on the lecture materials and self-study of students in accordance with approved methodology.
II. After the test tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:
1) definition, objective, tasks of informatics and medical informatics;
2) the structure of informatics. Basic definitions and categories of informatics;
3) information as key notion of informatics;
4) block scheme of a computer. The principles of personal computers (PC) functioning;

5) PC software. Classification of software.

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announces and home task is given for next time.

Elements for self-study of students outside of the classroom:
1. Hartley formula.
2. Proofs of Shannon's equation.
3. Main characteristics of modern PCs.
4. Modern operating systems.

MODULE 1.
THEMATIC MODULE 2.
THEME 3. Medical information systems.

Objective (general): To interpret classification of medical information systems, their potential and application in medical practice.	
Specific objectives:	**The result knowledge and skills level:**
1. To know classification of modern medical information systems.	1. To know how to use modern information systems for solving practical tasks in medicine.
2.To understand the place and potential of a specific information system in practical medicine.	3. To know potential of modern information systems and PCs application in medicine.
3. To master up-to-date information technologies in medicine.	

I. There is initial control of students' knowledge in form of written test at the beginning of the lesson.

II. After the test the tasks of the theme are fulfilled by consideration of main theoretic questions in form of oral inquiry according to the following plan:

1. What is information system?
2. Classification of medical information systems (MIS).
3. What are medical inquiry and communication systems designed for?
4. Advisory and diagnostic systems and their types.
5. What are medical hardware and software appliances? Their classification.
6. Expert workstation.
7. Classification of MIS of treatment and prophylactic institutions level.
8. Electronic medical card.
9. Basic levels of medical history computarization.
10. Classification of MIS of territorial level.

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) and home task is given for next time.

Elements for self-study of students outside of the classroom:

1. Medical hardware and software appliances.
2. Digital-to-analog converters.

Analog-to-digital converters.

MODULE 1.

THEMATIC MODULE 2.

THEME 4. Encoding and classification. Formalization and algorithmization of medical tasks.

Objective (general): To learn international systems of classification. To know how to present medical information in one of classification systems. To learn tasks formalization procedure.	
Specific objectives:	The result knowledge and skills level:
1. To consider types of algorithms.	1. To know types of algorithms and their properties.
2. To consider international classification	

systems.	2. To know how to build algorithms for solution of any task. 3. To know basic terms: classification, encoding. 4. To know how to use international classification system.

I. In the introductory part the teacher motivates the theme, formulates general objective of the lesson and specific objectives. The teacher also point out to the result level of knowledge and skills to be acquired as the result of the lesson.
II. The initial level of students' knowledge is determined at the beginning of the lesson in form of written test in accordance with approved methodology.
III. Tasks of the theme are fulfilled in form of oral inquiry:
1.The notion of semantic triangle.
2. Definition of classification. Examples of classification.
3. Types of codes: numeric, mnemonic, hierarchic, matching.
4. Classification systems:
A. ICD coding system.
B. DSM coding system.
C. SNOMED coding system.
D. ICPC coding system.
5. To define formalization and algorithmization.
6. What is an algorithm?
7. To name main properties of algorithm.
8. What ways of expressing algorithms presentation do you know?
9. To name types of algorithms:
A. Linear algorithms. Example of a linear algorithm.
B. Ramified algorithms. Example of a ramified algorithm.
C. Cyclic algorithms. Example of cyclic algorithm.
IV. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

Elements for self-study of students outside of the classroom:
1. Algorithms and their properties.
2. Types of algorithms: linear, ramified, cyclic.
3. Rules of building structural schemes/block diagram/structure chart of algorithms.

MODULE 1.
THEMATIC MODULE 2.
THEME 5. EVIDENCE-BASED MEDICINE.

Objective (general): To interpret main notions of evidence-based medicine. To know how evidence is used in medical decision making.	
Specific objectives:	**The result knowledge and skills level:**
1. To know basic categories and	1. To know the evidencibility of medical

definitions referring to evidence-based medicine. 2. To define main sources of accessible evidence in medicine.	research. 2. To know how to apply the principles of evidence-based medicine in practice.

I. In the introductory part the teacher motivates the theme, emphasizes its importance for medicine and formulates objective of the lesson: to know how to interpret main notions of informatics, to know the principles of PCs functioning and their software.

II. The teacher conducts test control of students' knowledge on the topic according to the approved methodology.

III. Then main questions of the topic are looked at:

1. Main notions of evidence-based medicine.
2. Stages of medical research planning.
3. Main sources of valid medical information.
4. Types of research.
5. Probability and generalization of research results.
6. Systematic and random errors.
7. Types of clinical research structure.
8. Kinds of randomization.
9. Masking the interferences.

IV. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 1.

THEMATIC MODULE 2.

THEME 6. BIOSTATISTICS. (THE BASICS OF STATISTICAL METHOD OF PROCESSING RESULTS OF MEDICAL AND BIOLOFICAL RESEARCH).

Specific objectives: to explain the principles of applying statistical criteria for medical and biological data processing.	The result knowledge and skills level: To demonstrate skills of using statistical functions and criteria for analysis of medical and biological data.

I. There is initial control of students' knowledge in form of written test at the beginning of the lesson.

II. After the test the tasks of the theme are fulfilled by consideration of main theoretic questions in form of oral inquiry according to the following plan:

- Distribution of statistic data;
- Estimates of total population parameters by sampling;
- Interval estimate;
- Test of statistical hypotheses.

III. The practical part of work is done in accordance with the manual "The Basics of Medical Informatics" given out to students at the lesson.

IV. At the end of the lesson this part of work is summarized, marks, received by the students based on initial test control, oral inquiry and performance of practical part of work, are announced.

Elements for self-study of students outside of the classroom:

- Non-parametric methods of mathematical statistics.
- Kolmogorov-Smirnov criterion.
- Iteration test.
- Determining reliability of differences of two selective populations.
- Sign test, maximum test, Wilcoxon test.
- Inversion test, χ^2-Pearson's test.

MODULE 1.
THEMATIC MODULE 2.
THEME 7. Use of data managers in solving medical tasks.

Specific objectives:	The result knowledge and skills level:
1. To understand application of modern data managers in medicine. 2. To learn main tools of work with "Rebus" and Microsoft Access data managers.	1. To understand the potential of the data managers use in solving medical tasks. 2. To demonstrate basic skills of work with "Rebus" data manager by building a "Donors of blood" data base. 3. To demonstrate main skills of working with Microsoft Access data manager in individual work.

I. Performance of the practical part of the laboratory work in accordance with the manual given out to the students during the lesson.
II. At the end of the lesson the laboratory work performed is summarized. "Donors of blood" data base is to be shown on the screen, sampling of notes in DB should be done and questions of the teacher on fields in the base built, types of fields, number of notes contained by the base are to be answered.
Then the topic of the next lesson is announced.

Elements for self-study of students outside of the classroom:

1. Reasonability of data managers application in medicine.
2. Use of data bases for saving medical information.
3. Use of data managers for information search and systematization.

MODULE 1.
THEMATIC MODULE 2.
THEME 8. Analysis of biological signals. Methods of biosignals processing.

Objective (general): To study main tools of analysis and processing of biological signals with help of modern computer technologies.

Specific objectives:	The result knowledge and skills level:
1. To know how to explain the link between origin of information from biosignals received and the biosystem studied, with a view to optimization of medical decision making process.	1. To know how to explain the ling between origin of information from biosignals received and the biosystem studied, with a view to optimization of medical decision making process.

2. To know types and differences of biosignals, the possibilities of their transformation in digital form for further processing on computer.	2. To know types and differences of biosignals, the possibilities of their transformation in digital form for further processing on computer

I. Introduction.

II. Test control on the theme based on lecture materials and results of self-study on the themes provided in the methodical manual.

III. Consideration of main questions on the topic of the lesson:

1) tools for biosignals processing and stages of their analysis;

2) registration and transformation of signals into digital form;

3) biosignals and their particular features;

4) types of biosignals;

5) analog-to-digital conversion;

6) examples of use of biosignals.

IV. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 1.

THEMATIC MODULE 2.

THEME 9. **Visualization of medical and biological data. The processing and analysis of medical images.**

Objective (general): To learn main visualization tools for medical and biological data, the processing and analysis of medical images.

Specific objectives:	The result knowledge and skills level:
1. To learn main tools of getting medical images and up-to-date trends of their processing.	1. To be well informed about medical images of organs, which is the main source of information in diagnosing.
2. To learn the processing and transformation of medical images in light of modern computer technologies.	2. To know how to interpret a medical image if it is processed differently with the help of computerized technologies.

I. Introduction.

II. Test control on the theme based on lecture materials and results of self-study on the themes provided in the methodical manual.

III. Consideration of main questions on the topic of the lesson:

1) notion of medical image;

2) medical image as an object of medical informatics;

3) tools for getting medical images;

4) the processing of medical images;

5) visualization methods.

IV. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 1.
THEMATIC MODULE 2.
THEME 10. Multimedia technologies in medicine.

Specific objectives:	The result knowledge and skills level:
1. To consider basic notions and terms.	1. To learn basic notions and terms.
2. To acquire the skills of work in MS PowerPoint for preparation of reports and presentations.	2. To demonstrate the skills of working in MS PowerPoint on the example of report on clinical research.

I. Performance of the practical part of laboratory work in accordance with the manual given out to students during the lesson.
II. The laboratory work is summarized at the end of the lesson, and every student has to demonstrate the knowledge of basic notions and terms, the created report as well as acquired skills of:
- Working in different regimes of PowerPoint;
- inserting text, diagrams, charts, pictures on the slides, turning on animation effects;
- formatting the report;
- going through the presentation in black and white.

Questions to laboratory work:
1. What tasks do multimedia technologies solve?
2. Categories of multimedia products.
3. The possibilities of multimedia technologies in providing information.
4. Minimal configuration of computer for using multimedia products.
5. Formats of presenting the information.
6. Encoding images.
7. Standards of information compression.
8. «Power Point» multimedia program.

III. The result knowledge level is determined based on written test answers and materials of the lecture "Multimedia technologies in medicine

Thereafter marks and theme for the next lesson are announced.

MODULE 2.
THEMATIC MODULE 3.
THEME 10. Modelling in biology and medicine.

Objective (general): To learn the methodology and modern approaches in mathematical modelling of phenomena, processes and situation in medicine and biology.

Specific objectives:	The result knowledge and skills level:
1. To know basic notions of modelling, classification of models, role and	1. To now the tools and methods of mathematical modeling of phenomena

importance of mathematical formally logical models in medical and biological research. 2. To understand physical and mathematical essence of models.	and processes in biology and medicine. 2. To know how to explain the principles of application and the operating of models in research practice.

I. Introductory words of the teacher.
II. There is test control of students' knowledge on the theme based on materials of the lecture and self-study of the topic.
III. Consideration of main questions on the theme:
1. Kinds of models. Computer technologies and mathematical modelling.
2. Mathematical model "exploiters-victims".
3. Mathematical modelling in immunology.
4. Mathematical model of bacteria population growth.
5. Mathematical modelling of infectious disease spread in a city or a town.
6. Exponential model of reproduction.
7. Logistic model of population growth.
8. Pharmacokinetic models.
IV. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry)are announced and home task is given for next time.

MODULE 2.
THEMATIC MODULE 3.
THEME 12. Systems analysis.

Objective (general): To learn main notions and principles of systems approach to a phenomenon or process considered.	
Specific objectives:	**The result knowledge and skills level:**
To understand the sense and principles of systems approach. To know general notions of systems theory and systems analysis.	To learn the systems approach with regard to life phenomena. Systems analysis and its main stages. To know how to use the principles of systems analysis in practice.

I.Test control (15 min.).
II. Questions for consideration during the lesson:
– The sense and principles of systems approach. Systems approach with regard to life phenomena.
– general notions of systems theory and systems analysis.
– Systems analysis and its main stages.
– Principles of systems analysis of interaction of body structures.
– Special features of systems analysis in medical tasks solution.

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) and home task is given for next time.

Elements for self-study of students outside of the classroom:

1. Systems analysis of pathogenesis and disease system complexity.
2. Principles of systems analysis of interaction f body structure.

MODULE 2.
THEMATIC MODULE 3.
THEME 13. Cybernetics.

Objective (general): To learn main notions and principles of cybernetics.	
Specific objectives:	**The result knowledge and skills level:**
– To understand the meaning and principles of control; – To know general notions of control theory.	To know how to use principles of cybernetic approach to diagnostics process in practice.

I.Test control.
II. Questions for consideration during the lesson:
– Main notions of cybernetics
– Subject, methods and content of biological cybernetics
– The notion of "functional cybernetics"
– The theory of functional systems as the basis for understanding vital processes
– The notion of "medical cybernetics". Main directions of medical and cybernetic research.
III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

Elements for self-study of students outside of the classroom:

1. Medical diagnostic process as typical cybernetic process.
2. 7 levels of cybernetic study of life.
3. Neurocybernetics.

MODULE 2.
THEMATIC MODULE 3.
THEME 13. Formal logic in solving diagnostics tasks, treatment and prevention of diseases.

Objective (general): To interpret main notions of mathematical logic.	
Specific objectives:	The result knowledge and skills level:

1. To demonstrate ability to present conditions of medical and biological tasks in formal view.	1. To know the basics of propositional logic. 2. To know logical operations and their properties. 3. To know ways of presenting logical functions.

I. Short teacher's introduction at the beginning of the lesson, then determination of studetns' initial knowledge level in form of written test.

II. Discussion of main questions of the lesson.

1. Artificial intelligence. The system of artificial intelligence.

2. Knowledge as basic notion of the artificial intelligence system in the systems of artificial intelligence.

3. Ways of knowledge classification:

- actual and strategic (classification based on the source of finding);
- declarative and procedural (classification based on functional purpose: description of an action or description of an object, at which the action is directed).

4. Properties of knowledge (internal interpretability, structuredness, coherence, semantic metrics, activity).

5. Models of knowledge presenting (logical, productional, semantic networks, frames, neural networks) and their main characteristics.

6. Logical models. Predicate. n-dimensional predicate. Expression as initialized predicate. Formal system. Boolean algebra.

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 2.

THEMATIC MODULE 3

THEME 15. Neural networks.

I. There is test control of students' knowledge on the theme in form of written test at the beginning of the lesson.

II. After the test the tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:

1) artificial neural networks (NN). The peculiarities of their functioning. Fields of NN application.

Objective (general): To learn main notions and principles of neural networks structure and their use in medicine.	
Specific objectives:	**The result knowledge and skills level :**
1. To consider main notions of neural networks.	1. To know the methodology of building neural networks
2. To consider the algorithm of building neural networks.	2. To be able to estimate the adequacy of neural network models.

2) the structure of biological neuron as a prototype for an artificial one.

3) the model of technical neuron, its properties

4) Neuron output. Types of activation functions.

5) Three-neuron one-layer perceptron as example of the simplest NN.
6) The teaching of a NN, its sense. Teaching with a teacher or without him.
7) Classification of NNs.
a) binary and analog neuron networks;
b) synchronous and non-synchronous neural networks;
c) classification by number of NN layers.
III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

Elements for self-study of students outside of the classroom:
1. Two-layer perceptron.
2. Non-linear activation functions.

MODULE 2.
THEMATIC MODULE 3.
THEME 16. Expert systems in medicine.

Objective (general): To understand the principles of structure and functioning of expert systems in medicine.	
Specific objectives:	The result knowledge and skills level:
1. To understand the potential of using expert systems in medicine.	1. To understand how expert systems differ from other software products.
2. To learn the components of a typical expert system.	2.To know the components of a typical expert system.
3. To learn the stages of expert system development.	3.To know the stages of expert system development.
4.To understand main types of expert systems performance.	4. To learn main types of expert systems performance.
5. To learn how knowledge can be presented in expert networks.	5. To know the forms of knowledge presentation in expert systems.
6. To understand the possibilities of neural networks application in medicine.	6. To know how neural networks are applied in medicine.
7. To learn specific cases of expert systems application in medicine.	7. To learn specific cases of expert systems application in medicine.

I. There is test control of students' knowledge on the theme in form of written test at the beginning of the lesson, dedicated to theoretical consideration of the theme.
II. After the test the tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:
1) Expert systems as a class of artificial intelligence systems. Particularities of expert systems implementation based on formal and informal logic;
2) Main criteria of reasonability of expert systems creation;
3) components of a typical expert system;
4) special features of expert systems (field of application, constructive peculiarities, method of problems solving etc.);
5) Inference engine. Direct and inverse inference;
6) Instrumental tools of expert systems;

7) Knowledge base of expert system, static, dynamic, working knowledge. Static, dynamic, working knowledge. Source of knowledge of expert system. Ways of knowledge receiving by expert system;
8) Main models of knowledge presenting: productional, frames, semantic networks, logical, neural networks;
III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced.
IV. The practical part of work is performed in accordance with the manual "The Basics of Medical Informatics" given out to students at the lesson. Marks are given based on quality and volume of completed work. If necessary, the teacher may propose a student answering the questions of result test control.

Elements for self-study of students outside of the classroom:
1. Examples of expert systems application in medicine.

MODULE 2.
THEMATIC MODULE 4.
THEME 17 Decision making.

Objective (general): To learn basic notions and principles of decision making.	
Specific objectives:	The result knowledge and skills level:
To know basic notions of mathematical theory of decision making.	To understand how the principles of decision theory are practically applied in medicine.

I. Test control.
II. Consideration of question on the theme:
1.The notion "decision making". Main stages of decision making procedure.
2.Methods of search for solution.
3.Classification of decision making tasks.
4.The notion "decision maker"
5.Stages of decision making task.
6.Mathematical programming. "Game theory".
7.Statistic and dynamic tasks.
8.The notion of null hypothesis.
9.Use of Bayes' theorem.
10.Technology of diagnostic test reliability check.
11.The notions of sensibility and specificity.
12.Simulation model.
III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) and home task is given for next time.

Elements for self-study of students outside of the classroom:

1. The problem of decision making. Main components of decision making process.
2. Interactive approach to decision making.
3. Classification of decision making tasks.
4. Main methods of decision making in medicine.

MODULE 2.
THEMATIC MODULE 4.
THEME 18. Medical hardware and software complexes complexes.

Objective (general): To study purpose and principles structure of hardware and software complexes.

Specific objectives:	**The result knowledge and skills level:**
1. To consider types of hardware and software complexes.	1.To know how the architecture of computer research is built.
3. To learn main types of hardware and software complexes.	4. To know main stages of computer functional research.
3.To consider the meaning of computer processing of medical information in medical hardware and software complexes x.	

I. There is initial control of students' knowledge in form of written test at the beginning of the lesson.
II. After the test the tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:
Purpose and principles of structure of hardware and software complexes

1) Types of structure of hardware and software complexes.
2) Architecture of computer functional research.
3) Main stages of computerized functional research.
4) Kinds of computer diagnostics:

- electroencephalogram (EGG)
- evoked potentials (EP)
- electrocardiogram (EKG)
- electromyogram (EMG)
- electrooculogram (EOG)
- rheogram (RG)
- galvanic skin response (GSR)
- phohocardiogram (PKG)
- spirogram (SG)
- respiratory rhythm dynamics
- pulse oximetry
- plethysmogram

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 2.
THEMATIC MODULE 4.
THEME 19. Apparatuses and systems of replacement of lost functions of a human being.

Objective (general): To learn purpose and construction principles of hardware and software complexes.	
Specific objectives:	**The result knowledge and skills level:**
To consider main types of modern medical equipment allowing to fully or partially replace lost human functions.	1.To know main types of artificial organs and systems; 2.To understand purpose and principles of work of main types of apparatuses and replacement systems of lost human functions.

I. There is initial control of students' knowledge in form of written test at the beginning of the lesson.
II. After the test the tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:

- heart pacemakers;
- modern technologies in hearing aid;
- kidney machine;
- artificial circulation and artificial heart;
- artificial pancreas.

III. At the end of the lesson completed work is summarized, marks, received by the students at the lesson (average between test mark and mark for oral inquiry) are announced and home task is given for next time.

MODULE 2.
THEMATIC MODULE 4.
THEME 20. Computer networks. Medical information resources.

Objective (general): to understand the principles of construction and the functioning of computer networks for their further use in professional career.	
Specific objectives:	The result knowledge and skills level:
1. To look at the notion and main components of computer networks.	1. To understand the notion and main components of computer networks.
2.To consider main types of computer networks.	2.To know classification of computer networks.
3.To learn network architecture and OSI model.	3.To understand the notion of network architecture and OSI model.
4. To consider main types of protocols and standards of computer systems.	4. To know main types of protocols and standards of computer systems.
5. To look at the notion of addressing in	5. To understand the notion of addressing

computer networks. 6.To consider main types of addresses in the Internet.	in computer networks. 6.To know main types of addresses in the Internet.

II. There is initial control of students' knowledge in form of written test at the beginning of the lesson.

II. After the test the tasks of the topic are fulfilled. Main theoretic questions are considered in form of oral inquiry in accordance with the following plan:

1). Notion of computer network. Basic communication model.

2). Classification of computer networks based on control method, speed of information transfer, scale of geographic spread, type of transmission environment, connection topology.

3). Network architecture and OSI model.

4). Network protocols and standards.

5). Addressing in the Internet.

6). Computer addresses.

7). Electronic mail.

8). Possibilities of the Internet.

3. At the end of the lesson completed work is summarized, marks, received by the students at the lesson are announced and home task is given for next time.

MODULE 2.

THEMATIC MODULE 4.

THEME 21. Ethical and legal rules in medicine.

Objective (general): To explain ethical and legal principles of medical and biological information management.

Specific objectives:	**The result knowledge and skills level:**
1. To learn legal and ethical principles of medical and biological information management.	1. To know regulatory and legal aspects of work of medical institutions. 2. To know how to build knowledge matrix for information protection.

I. There is initial control of students' knowledge in form of written test at the beginning of the lesson.

II. After the test is completed, main questions on the theme are considered in form of interview:

- Current situation in the sphere of information safety.
- Categories of information safety: confidentiality, integrity, secrecy, protection, authenticity, appelatebility, reliability, accuracy, controllability, identification control.
- Protection of medical information.
- Electronic medical card. Advantages and disadvantages.
- Degree of protection of information on patients.
- Characteristics influencing information safety.
- Problems of medical secrecy protection.

- Classification of breaches of information protection: the stealing of data carriers, the copying of information on PC, unauthorized connection to communication lines, interception of electromagnetic radiation during processing of information.
- Modelling the processes of IPS (information protection systems): model of IPS representation, requirements to the model (universality, complexity, simplicity, clearness, practicality).
- Formation of information safety model.

3. At the end of the lesson completed work is summarized, marks, received by the students at the lesson are announced and home task is given for next time.