



# METHODS AND MEANS OF DIAGNOSING HUMAN PATHOLOGY

## Working program of educational discipline (Syllabus)

### Requisites of the Course

Cycle of Higher Education	<i>First (bachelor's)</i>
Branch of knowledge	<i>16 Chemical and Bioengineering</i>
Specialty	<i>163 Biomedical Engineering</i>
Educational program	<i>Medical Engineering</i>
Course status	<i>Mandatory discipline</i>
Mode of study	<i>full-time / day / mixed / remote</i>
Year of study/Semester	<i>1<sup>st</sup> year (autumn semester)</i>
ECTS workload	<i>4 ECTS credits / 120 hours</i>
Testing and Assessment	<i>Final Test, Module Test , Homework</i>
Course schedule	<i>According to the schedule on the site <a href="http://rozklad.kpi.ua/">http://rozklad.kpi.ua/</a></i>
Language of instruction	<i>English</i>
Information about course supervisor / teachers	<i><b>Lecturer:</b> Associate Professor of BME, Candidate of Biological Sciences Kalashnikova Larysa , e-mail – <a href="mailto:doc_hom2000@yahoo.com">doc_hom2000@yahoo.com</a> <b>Practical:</b> Associate Professor of BME, Candidate of Biological Sciences Kalashnikova Larysa , e-mail – <a href="mailto:doc_hom2000@yahoo.com">doc_hom2000@yahoo.com</a></i>
Course placement	<i>Platform «Sikorsky» - course "<b>Methods and means of diagnosing human pathology</b>" " <a href="https://do.ipk.kpi.ua">https://do.ipk.kpi.ua</a></i>

### Distribution of hours

Semester	Lectures	Practical	Laboratory	Self-study
<i>spring semester</i>	<i>28</i>	<i>26</i>		<i>66</i>

### Curriculum of the discipline

#### 1. Course description, goals, objectives, and learning outcomes

*The main purpose of the discipline "Methods and means of diagnosing human pathology " is to form students' ability to plan instrumental diagnostic activities, apply and improve medical devices to effectively assess the condition of human organs and systems and provide sound diagnostic conclusions.*

*The purpose of teaching the discipline is to provide students with theoretical knowledge and the formation of practical skills in modern diagnostic methods, history and state of development of tools for instrumental assessment of functional systems and individual human organs, basic requirements for diagnostic equipment, the degree of approximation of its capabilities to medical practice. , existing and promising methods for diagnosing pathology of organs and functions of the human body. The discipline also covers issues of operation, rational use of diagnostic equipment, safety of instrumental research, design solutions used in the creation of diagnostic devices, their systems and complexes, problems of reliability of diagnostic results, the relationship of instrumental diagnostics with clinical and laboratory diagnostics.*

*The objectives of the discipline are:*

- ✓ identification of modern problems of instrumental diagnosis of human pathology;*

- ✓ *mastering the methods and means of research using medical equipment and computer technology to examine a person;*
- ✓ *mastering the general principles and basic methods of assessing the functional state of human organs and systems;*
- ✓ *mastering knowledge about the equipment of departments, offices of functional diagnostics;*
- ✓ *mastering the methods of measuring the main indicators of the functioning of human physiological systems and evaluating research results.*

*Since the discipline is selective, its study requires knowledge of the basics of developing operational documentation.*

**General competencies** (OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):

**GC 1** - Ability to apply knowledge in practical situations

**GC 2** - Knowledge and understanding of the subject area and understanding of professional activity

**GC 6** - Ability to search, process and analyze information from various sources.

**GC 8** - Ability to make well-grounded decisions

**GC 10** - Safe activities skills.

**Special (professional) competencies** (OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):

**PC 4** - Ability to provide technical and functional characteristics of systems and tools used in medicine and biology (in prevention, diagnosis, treatment and rehabilitation).

**PC 6** - Ability to effectively use tools and methods for analysis, design, calculation and testing in the development of biomedical products and services.

**PC 11** - Ability to understand the technical and functional characteristics of systems, methods and procedures used in prevention, diagnosis and therapy.

**PC 13** - Ability to provide and monitor compliance with safety and biomedical ethics when working with medical equipment .

**The program learning outcomes after studying the discipline "" Methods and means of diagnosing human pathology "" are** (OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):

**PLO 1** - Understanding of fundamental-applied, medical-physical and bioengineering bases of technologies and equipment for research of processes of a human body

**PLO 7** - Understanding of scientific and technical principles that underlie the latest advances in biomedical engineering.

**PLO 11** - Knowledge of the basic conditions of operation of diagnostic and therapeutic systems, medical complexes and systems.

**PLO 12** - Operation and maintenance of medical equipment in accordance with the rules established by technical documentation and regulations.

**PLO 17** - Knowledge of general information about the human body and its functions from the standpoint of a systems approach and their use in biomedical engineering .

**PLO 21** Knowledge of the basic methods and tools used to quantify the functioning of physiological systems .

**PLO 31** Understanding of theoretical and practical approaches to the creation and management of medical equipment and medical technic.

**PLO 43** - The use of methods and means of quantitative evaluation of the functioning of physiological systems in practical engineering..

## **2. Prerequisites and postrequisites of the course (place in the structural and logical scheme of education according to the relevant educational program)**

*The discipline "Methods and tools for diagnosing human pathology" is interdisciplinary. It integrates, according to its subject, knowledge from other disciplines: biology, anatomy and clinical physiology, digital and analog circuitry, design and construction of electronic medical equipment, etc. According to the structural and logical scheme of the bachelor's program, the discipline is closely related to other disciplines of general and professional training: "Laboratory medical equipment", "Medical physics", "Medical equipment", as well as disciplines of language and practical training.*

*The acquired practical skills and acquired theoretical knowledge during the study of the discipline "Methods and tools for diagnosing human pathology" can be used later in mastering the discipline "Research work on the thesis", undergraduate practice in the specialty and is the basis for training diploma theses in the specialty and in further practical work in the specialty.*

## **3. Course Overview**

*The main sections and topics that will be considered in the process of studying the course:*

### **Section 1. The main types and methods of diagnosis.**

**Topic 1.1.** *General classification of diagnostic methods.*

**Topic 1.2.** *Means of visualization of organs and structures of the organism and their functional assessment.*

### **Section 2. Instrumental diagnostic methods**

**Topic 2.1** *X-ray methods of research. The principle of operation of X-ray equipment. Hardware of X-ray examination methods.*

**Topic 2.2.** *Magnetic resonance research method. Principle of the method. Classification of MRI equipment.*

**Topic 2.3.** *The use of ultrasound in medicine. The principle of formation of ultrasonic equipment. Types of ultrasound imaging of human organs and systems. Diagnostic capabilities of ultrasound methods*

**Topic 2.4.** *Radioisotope diagnostic methods.*

**Topic 2.5.** *Characteristics of methods for recording the electrical activity of organs: the physical basis of the method of cardiography. ECG recording equipment. Diagnostic capabilities of the method.*

**Topic 2.6 ..** *Non-invasive cardiac diagnosis. Holter monitoring.*

*Rheography, Blood pressure measurement. Physical bases of methods Hardware and diagnostic possibilities.*

**Topic 2.7.** *Characteristics of methods for recording the electrical activity of organs: the physical basis of the method of electroencephalography. Equipment for EEG registration. Diagnostic capabilities of the method.*

**Topic 2.8.** *Characteristics of methods for recording the electrical activity of organs: the physical basis of the method of myography. Equipment for EMG registration. Diagnostic capabilities of the method.*

**Topic. 2.9.** *Endoscopic research methods. Structural features and principle of operation of endoscopic equipment. Hardware of X-ray examination methods. Diagnostic possibilities of endoscopy.*

**Topic. 3.0.** *Thermography: the principle of the method, tooling.*

**Topic. 3.1.** *Computer diagnostics: the principle of the method, tooling.*

#### 4. Coursebooks and teaching resources

##### Basic:

1. Almer P.E.S. *Manual of Diagnostic Ultrasound* World Health Organization, 1995.-353 p  
<http://digicollection.org/hss/documents/s15962e/s15962e.pdf>
2. Benseler J. S. *The Radiology Handbook* Ohio university press, 2006.- 205 p.  
<https://www.moscomm.org/uploads/userfiles/The%20Radiology%20Handbook.pdf>
3. Dev P. Chakraborty *Observer Performance Methods for Diagnostic Imaging: Foundations, Modeling*, 2015.-.535 p  
<https://books.google.com.ua/books?id=qCjpDwAAQBAJ&pg=PR28&lpq=PR28&dq=instrumental+medical+methods+of+diagnosis+textbook+free&source>
4. *Manual of diagnostic ultrasound.* Buscarini, Elisabetta. II.Lutz, Harald. III.Mirk, P. IV.World Health Organization. V.World Federation for Ultrasound in Medicine and Biology6 2015.- 123 p.  
[https://apps.who.int/iris/bitstream/handle/10665/85386/9789241548540\\_eng\\_ch6bibandindex.pdf?sequence=5&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/85386/9789241548540_eng_ch6bibandindex.pdf?sequence=5&isAllowed=y)
5. Pandey .P.,Meenu M. *RESEARCH METHODOLOGY: TOOLS AND TECHNIQUES* Bridge Center, European Union Printed in Romania First published,2015.-116.  
<https://www.euacademic.org/BookUpload/9.pdf>
6. *THE PRACTICAL COURSE IN CLINICAL MEDICINE /Edited by Władysław Grabski and Dariusz Nowak, Faculty of Biomedical Sciences and Postgraduate Training, Department of Nursing and Obstetrics, Łódź, 2009.- 180 .p.*  
[http://a.umed.pl/znpmk/files/PD\\_I\\_scr.pdf](http://a.umed.pl/znpmk/files/PD_I_scr.pdf)
7. Pietro Gori *Introduction to Magnetic Resonance Imaging (MRI)* Enseignant-chercheur Equipe IMAGES - Télécom Paris , 2019.- 85 p.  
<https://perso.telecom-paristech.fr/bloch/P6Image/MRI.pdf>
8. Ary L. Goldberger *Clinical electrocardiography : a simplified approach / Ary L. Goldberger, Zachary D. Goldberger, Alexei Shvilkin.—8th ed. 2018.- 233 p*  
<https://www.medicos.cr/web/documentos/EMC2018/ekq/Golbergers.%20Clinical%20Electrocardiography.pdf>

##### Supplementary:

1. Dillon Patrick F. *Biophysics A Physiological Approach*, 2016.- 314p  
<https://epdflibrary.com/map2/1107001447>
2. *ECG Basics* Rebecca Sevigny BSN, RN, CCRN 2012. - 63 p  
[https://www.bc.edu/content/dam/files/schools/son\\_sites/npconference/pdf/W-2-Sevigny-Basic%20ECG.pdf](https://www.bc.edu/content/dam/files/schools/son_sites/npconference/pdf/W-2-Sevigny-Basic%20ECG.pdf)
3. Ramachandran G.N. *Biophysics* Kluwer Academic Publishers New York, Boston, Dordrecht, London, Moscow, 2002.- 267 p.  
[https://www.ewingdigital.com/text\\_content/115875395635e9fee6bc8286.pdf](https://www.ewingdigital.com/text_content/115875395635e9fee6bc8286.pdf)
4. Salman Shaikh, Chandrashekhar Deopujari *The endoscope and instruments for minimally invasive neurosurgery 2020n-20 p*  
<https://oaepublishstorage.blob.core.windows.net/29b64a5d-b9e0-46db-8537-d28663373146/3811.pdf>
5. Barucci A. *Magnetic Resonance Spectroscopy Data Analysis for Clinical Applications* università degli studi di Firenze, 2015.- 135 p.  
[https://tel.archives-ouvertes.fr/tel-01389254/file/Thesis\\_AB\\_MRS\\_complete\\_date.pdf](https://tel.archives-ouvertes.fr/tel-01389254/file/Thesis_AB_MRS_complete_date.pdf)

## Educational content

### 5. Methods of mastering the discipline (educational component)

№ s/n	Subject	Program learning outcomes	The main tasks	
			Control measure	Термін виконання
1	General classification of diagnostic methods. Means of visualization of organs and structures of the organism and their functional assessment	PLO 1 PLO 7 PLO 12	Practical work 1	1 <sup>st</sup> week
2	X-ray methods of research. The principle of operation of X-ray equipment. Hardware of X-ray examination methods.	PLO 1 PLO 7 PLO 12	Practical work 2-	2 <sup>nd</sup> week
3	Magnetic resonance research method. Principle of the method. Classification of MRI equipment	PLO 1 PLO 21 PLO 43	Practical work 3	3 <sup>rd</sup> -4 <sup>th</sup> week
4	The use of ultrasound in medicine. The principle of formation of ultrasonic equipment. Types of ultrasound imaging of human organs and systems. Diagnostic capabilities of ultrasound methods	PLO 1 PLO 12 PLO 31	Practical work 4	5 <sup>h</sup> - 6 <sup>th</sup> week
5.	.Radioisotope diagnostic methods	PLO 1 PLO 7 PLO 12	Practical work 5	7 <sup>th</sup> week
6.	Non-invasive cardiac diagnosis. Holter monitoring. Rheography, Blood pressure measurement. Physical bases of methods Hardware and diagnostic possibilities.	PLO 11 PLO 12 PLO 21	Practical work 6	8 <sup>th</sup> - 9 <sup>th</sup> week week
7	The physical basis of the method of electroencephalography. Equipment for EEG registration. Diagnostic capabilities of the method.	PLO 12 PLO 21 PLO 31	Practical work 7	10 <sup>th</sup> week
10.	. The physical basis of the method of myography. Equipment for EMG registration. Diagnostic capabilities of the method	PLO 1 PLO 24 PLO 29	Practical work 8	11 <sup>th</sup> week
11.	Thermography: the principle of the method, tooling. Computer diagnostics: the principle of the method, tooling.	PLO 7 PLO 21 PLO 31	Practical work 9	12 <sup>th</sup> - 13 <sup>t</sup> -week
13	Endoscopic research methods. Structural features and principle of operation of endoscopic equipment. Hardware of X-ray examination methods. Diagnostic possibilities of endoscopy.	PLO 21 PLO 31 PLO 43	Practical work 10	14 <sup>th</sup> - 15 <sup>th</sup> week week
15	Module test		Practical work 11	16 <sup>th</sup> week
16	Home test		Practical work 12	17 <sup>th</sup> week
17	Final tests		Practical work 13 Pass Final tests	18 <sup>th</sup> week



## 6. Self-study

*One of the main types of semester control during the mastering of the discipline " **Methods and means of diagnosing human pathology**" is to perform homework. Homework is performed in accordance with the requirements, within the period specified by the teacher.*

*The main purpose of homework is to solve a practical problem using the material learned in lectures and independently, and practical skills acquired in practical classes. The student can write homework only on the subject agreed with the teacher.*

### **Approximate subject of reports:**

*№1 - Comparison of radiological methods.*

*№2 - Diagnostic value of the ECG method.*

*№3 - Methods of measuring blood pressure.*

*№4 - Ultrasound diagnostics.*

*№5 - Modes and diagnostic capabilities of echocardiography.*

*№6 - Methods for diagnosing pathology of the respiratory system.*

*№7 - Diagnosis of pathology of the central nervous system.*

*№8 - Methods of diagnosis of renal pathology.*

*Homework is a current control measure that covers practical skills in applying modern tools and technologies for searching, processing and analyzing information, researching interdisciplinary areas related to biomedical engineering using modern tools, critically analyzing the results of own research and the results of other researchers in context the whole set of modern knowledge about the researched problem.*

*The title page of the Homework should have the following content: the name of the university; name of the faculty; name of department; name of specialty, name of educational-professional program, name of academic discipline; theme of calculation and graphic work; surname and name of the student, course, number of the academic group, year.*

*The title page is followed by a detailed plan (content) of the Homework in which it is necessary to highlight the introduction, sections of the main content (main topics studied), their subdivisions (if necessary), conclusion, list of sources used. The table of contents on the right indicates the page numbers at the beginning of each question. Each section begins on a new page.*

*The total amount of Homework, depending on the chosen topic, can vary from 15 to 20 pages of the main text (in agreement with the teacher). The scope of Homework work is determined by the student's ability to briefly and at the same time comprehensively explain and analyze the educational material. Mandatory requirement: clear reference to sources of information. All figures, facts, opinions of scientists, quotations, formulas must have a reference in the form of [2] (number means the number of the source in the list of references at the end of the creative work. The list of used sources (at least 5 sources) taken from the Internet, you need, as for ordinary literature, specify the author, the title of the article, and then provide the address of the site on the Internet.*

*Homework is evaluated by the following criteria: the logic of the plan; completeness and depth of disclosure of the topic; correct formulation of conclusions and conclusions; design; substantiation of the student's own opinion on this issue in the form of a conclusion.*

*Deadline for submission of calculation and graphic work for verification: 13-14th week of study. Homework is not tested for plagiarism, but must meet the requirements of academic integrity. In case of academic dishonesty, the work is canceled and not checked.*

## 7. Attendance policy

### Attending classes

Attendance at lectures is optional. Attending practical classes is desirable. All works and activities are aimed at the students' compliance with the assessment rating requirements. A significant part of a student rating is formed through active participation in activities in practical classes. Therefore, skipping a practical class does not allow a student to get points in the semester rating. General assessment takes place according to a scheme of the agreed grading system. Expected learning outcomes, control measures and deadlines are announced to students in the first practical class.

### Control measures missed

Missed control measures (defense of practical work) can be worked out during the next classes, (provided that the task is scheduled for the current lesson), or in consultations.

Skipped express tests/ quizzes cannot be completed.

Skipped Module Test can be worked out in consultations.

### Violation of deadlines, penalty points and rewarding points

Rewarding points		Penalty points*	
Criterion	Weight points	Criterion	Weight points
Improving and expanding the topic of Hometest	1 point (for each practical work)	Uncorrect of Home work	From -0.5 points to -5 points (depending on the delivery date)
Passing distance courses on topics that are agreed with teachers	5 points	Untimely implementation of a Home Test	- From -1 points to -3 points (depending on the delivery date)

\* if the control measure was missed for a good reason (illness, which is confirmed by a certificate of the established sample) - penalty points are not accrued.

### Academic integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>.

### Norms of ethical behavior

Normative principles of behavior of students and employees, defined in sections 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>.

### Procedure for appealing the results of control measures

Students have the opportunity to raise any issue related to the control procedure and expect it to be addressed according to predefined procedures.

The student has the right to appeal the results of the control measure according to the approved provision on appeals in the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (approved by the order №NON/128/2021 from 20.05.2021) - <https://osvita.kpi.ua/index.php/node/182>

### Inclusive education

The course " **Methods and means of diagnosing human pathology** "can be taught to the most of students with special educational needs.

### Distance learning

Distance learning takes place through the Sikorsky Distance learning Platform «Sikorsky».

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the

material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / test tasks, practical work).

Performance of practical works is carried out during independent work of students in a remote mode (with a possibility of consultation with the teacher through e-mail, social networks).

### **Teaching in a foreign language**

Teaching in English is carried out only for foreign students.

At the request of students, it is allowed to study the material with the help of English-language online courses on topics that correspond to the topics of specific classes.

## **8. Monitoring and grading policy**

### **Grading system (current control):**

Home work	Homework	%	Weight points	Number	Total
1.	Express control works	25	5	5	25
2.	Active work on a practical classes	15	3	5	15
3.	Тестові завдання	10	2	5	20
4.	Module Test (MT)	20	20	1	20
5.	Home control work	30	30	1	30
6	Final Test <sup>1</sup>	70	70	1	70
	Всього				100

In the final practical class of the course, students will add their rewarding points, if there are any, to the performance score, and /or subtract their penalty points if there are any, from the performance score, and in case it is in total higher than 60 points, they may either get their Pass or take the Final Test to improve their grade. If the grade for the Final Test is higher than the final performance grade, the student receives the grade based on the results of this Test. If the grade for the Test is lower, the final performance grade is cancelled and the student receives a grade based on the results of the Test.

Students whose final performance grade is 30-60 points have to take the Final Test in order to complete the course.

Students whose score is below 30 did not meet the requirements of the course and are not allowed to take the Final Test.

**Calendar control (CC)** is performed twice a semester as monitoring of the current state of compliance with syllabus requirements.

The purpose of calendar control is to improve the quality of student learning and monitor the implementation of the schedule of the educational process by students.

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<sup>1</sup> Taken into account in the amount of the rating together with the grade for CGW in case the student has not scored 60 points per semester or he wants to improve his grade.



Criterion		The first CC	The second CC	
Deadline of calendar controls		8th week	14th week	
Conditions for obtaining a positive calendar control	Current grade	≥ 24 балів	≥ 40 балів	
	Execution of practical work	№№1-4	+	+
		№№5-8	-	+
	Express control works /quizzes	At least 4 of any lectures	+	-
		At least 8 of any lectures	-	+
	Module Test	Estimated MCW	-	+
Home control work	Estimated HCW		+	

In the case of a plagiarism or an academic poor quality during training the control measure is not credited.

### Semester certification of students

Mandatory requirements for the admission to the Final Test		Criterion
1	Current grade	RD ≥ 40
2	All practical works are completed	More than 20 points
	Obtaining a positive assessment for the performed Home control work	More than 10 points
	Obtaining a positive assessment for the performed Module Test	More than 10 points
3	Writing at least 3 express control works	More than 6 points

The results are announced to each student separately in the presence or remotely (by e-mail). It is also recorded in the "Electronic Campus" system.

Optional requirements for admission to closure:

1. Active work during practical classes.
2. Positive result of the first and the second calendar control.
3. Attending of lectures.

The final performance score or the results of the Final Test are adopted by university grading system as follows:

Number points	Assessment on the university scale
100-95	Excellent / Відмінно
94-85	Very good / Дуже добре
84-75	Good / Добре
74-65	Satisfactory / Задовільно
64-60	Sufficient Enough / Достатньо
Less 60	Unsatisfactory / Незадовільно
The course requirements are not met	Not allowed / Не допущено

### 9. Additional information on the course (educational component)

The list of questions for preparation for modular control work, and also for preparation for credit is given in appendix 1.

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

*The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / quizzes, practical work).*

***Work program of the course (syllabus):***

***is developed by*** Associate Professor of BME, Candidate of Biological Sciences, Larisa Kalashnikova

***Approved by*** the Department of Biomedical Engineering (protocol № \_\_\_ to \_\_\_\_\_)

***Approved by*** the Methodical Commission of the Faculty of Biomedical Engineering (protocol № \_\_\_ to \_\_\_\_\_)

**The list of questions for preparation for the Module Test,**

**And also for preparation for the Final test**

1. Comparative characteristics of radiological research methods
2. Rheography, the essence of the method, use to assess blood circulation.
3. Cardiography, the essence of the method, diagnostic value
4. Holter monitoring, its significance for diagnosis.
5. How is Korotkov's blood pressure measured? What values of pressure thus turn out
6. Health, WHO definitions and others.
7. Illness, differences from the norm, state of health.
8. MRI: the essence of the method, diagnostic principle
9. Classification of equipment for MRI
10. Physical foundations of MRI
11. Types of MRI technologies
12. Contrasts for MRI method
13. Ultrasonic contrast agents
14. Diagnostic value of radiological research methods
15. Classification of methods of X-ray examination
16. The principle of the method of thermography
17. The principle of the MRI method
18. Physical foundations of electromyography
19. Diagnostic value of myography
20. Fundamentals of electroencephalography.
21. Methods of electroencephalography. Survey equipment
22. Types of ultrasonic sensors and their medical application
23. Physical bases of ultrasonic dopplerographic research
24. Physical bases of ultrasonic two-dimensional examination
25. Types of ultrasound examination
26. The principle of operation of the endoscope.
27. Classification of endoscopic techniques
28. The structure of the endoscope.
29. Basics of thermography.
30. Diagnostic significance of thermography
31. Types of electrodes for electroencephalography and their features
32. The essence of the method of ophthalmography and its role in ophthalmographic examination
33. Optical computer diagnostics - the essence of the method and medical application
34. Electromyography, the essence of the method, block diagram of the apparatus for myography
35. Diagnostic possibilities of endoscopy.
36. Artifacts of ultrasound research
37. What is a problem patient
38. Classification of ultrasonic devices
39. Classification of radioisotope research methods
40. The principle of the method of scintigraphy