MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION OF THE REPUBLIC OF UZBEKISTAN

MINISTRY OF HEALTHCARE

TERMEZ BRANCH OF
TASHKENT MEDICAL ACADEMY
DEPARTMENT OF SOCIAL AND HUMANITARIAN SCIENCES

"Approved"
Deputy director for
educational affairs
_____ Y. B. Gulyamov
"27" 12 2022.

BIOPHYSICS
MODULE PROGRAM

Field of knowledge: 900 000 – Healthcare and welfare

The field of education: 910000 – Healthcare

Educational directions: 60910200 – General medicine

Termez -2022

The working curriculum of the module is approved by the Tashkent Medical Academy order No. 246 dated 05/08/2022 (Appendix 1 of the order) "Biophysics". Prepared on the basis of the "General genetics" module program.

Developers:

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Reviewers:

Internal Reviewer:

K.X.Axmedov - Head of the department of normal physiology, pathological physiology, pharmacology and clinical pharmacology

External reviewer:

Tursunov S.N. - TerSU Professor of the Department "History of Uzbekistan", d.h.s.

The working module program " Biophysics" was reviewed by the TB TMA Department of social and humanitarian sciences and recommended to the branch council. (Declaration No. ___ of "___" ____ of 2022.)

Module was discussed and approved by the branch council. (Declaration No. 5 of "27" 12 of 2022.)

Head of the department : Tursunov N.N

Dean of the Faculty : Mustanov J.A

Head of the educational and methodological department: Berdiyeva. Z.U

Module code BF1104	Academic year 2022/2023	Term 1	Credits 5
Module type Mandatory	Language of education English		Class hours per week 5/5

Module name	Auditorium training (hours)	Independent education (hour)	Total load (hours)
Medical biology. General genetics	14/61	75	150

I. Content of the module

The purpose of teaching the module is to provide students with the theoretical and practical knowledge necessary for the correct interpretation of the physiological processes in the activity of organs and systems in the body, based on the processes of the appearance of various diseases in the organs and tissues of the body. is to show the primacy of physical changes.

To achieve this goal, the module fulfills the tasks of forming students theoretical knowledge, practical skills and methodical approach to processes and scientific worldview.

The task of the module is to study the importance of physical laws in the implementation of the activities of organizational parts of the human body and the general physical laws underlying the activities of the organs and tissues of the body; study of mechanical, bioelectric and optical properties of body tissues and fluids; understand their unity in terms of the unity of content and function in their physiological state and anatomical structure; to have ideas about the main physical mechanisms of physical healing and negative effects of the external environment.

II. The main theoretical part

II.I. The module includes the following topics:

№	Topics of lectures	Hours
1	Mechanical properties of solids and biological tissues. Brief history, tasks of biophysics, its importance in the development of practical medicine. Deformation and its types. Mechanical properties of biological tissues	2
2	Fundamentals of acoustics. The use of sound in medicine. Sound and its physical and psychophysical characteristics. Weber-Fechner law. Ultrasound and its application in medicine	2
3	Hemodynamics. Physical basis of cardiac activity. Mechanical and electrical models of blood circulation. The flow of blood	2

	through veins and capillaries. The principle of operation of the artificial blood circulation apparatus.	
4	Thermodynamics. Thermodynamics of living systems. Energy sources in living systems. Open thermodynamic systems. The first and second laws of thermodynamics and their application to biological systems.	2
5	Optics. Light properties. Optical system of the eye. Electromagnetic theory of light. Light properties. The optical system of the eye and its physical properties. Application of optical methods in medicine	2
6	Radioactivity. The effect of ionizing radiation on living organisms. Types of ionizing radiation. The effect of ionizing radiation on the human body and methods of protection. The use of radioactive radiation in medicine	2
7	Modern methods of visualization. Biophysical bases of MRI, CT, PET functioning	2
	Total amount of hours:	**14**

Comment: Lecture classes on the module are equipped with multimedia installations akadem in the auditorium. passes in the flow of groups.

III. Distribution of practical trainings allocated to the module by topics

№	Seminar topics	Hours
1	Physical quantities and units of measurement. Theory of errors	5
2	Laboratory work №. 1. Determination of Young's modulus of solids and biological tissues	5
3	Acoustics. Physical properties of sound. Physical properties of the hearing organs. Determination of the threshold of hearing. Viscosity of biological fluids. The value of viscosity in medicine.	5
4	Laboratory work №. 2. Determination of the viscosity of an unknown liquid with an Oswald-Pinkevich viscometer.	5
5	Determination of viscosity by the Stokes method. Determination of surface tension by droplet separation method.	5
6	Laboratory work № 3. The study of the physical foundations of measuring blood pressure in the clinic.	5
7	The study of the application of the laws of thermodynamics to living organisms. Determination of heat capacity ratios by the Clément-Desormes method.	5

8	Laboratory work №4. Determination of air humidity with an Assmann psychrometer	5
9	Electrical conductivity of biological fluids and tissues at direct current. Air ions and their therapeutic and prophylactic effect.	5
10	Thermocouple calibration and study of its use as a thermometer. Registration of biopotentials. The study of the physical foundations of electrography	5
11	Laboratory work №5.Determination of the wavelength of light using a diffraction grating	5
12	Determination of optical density and conductivity of a liquid using a photoelectric colorimeter	6
	Total amount of hours:	**61**

Practical and laboratory training in rooms equipped with multimedia devices, computers and necessary laboratory equipment. will be transferred to the group separately. Classes are held using active and interactive methods, advanced pedagogical technologies. Visual materials, video materials and informational multimedia devices are used for this purpose.

IV. Practical skills:

1. Understanding of physical quantities and their measurement units.
2. Theory of errors. Statistical analysis of medical biological information.
3. Determination of Young's modulus of solid bodies and biological tissues
4. Determination of hearing sensitivity of the ear
5. Familiarity with the methods of determining the viscosities of liquids.
6. Determining the surface tension coefficient by the droplet break method
7. To study the physical basis of blood pressure measurement in the clinic
8. Determining the ratio of gas heat capacities using the Kleman-Dezorm method.
9. Air humidity study using an Assman psychrometer
10. Learning how to calibrate a thermocouple and use it as a thermometer
11. Studying the physical basis of electrocardiography.
12. Determination of the optical density and conductivity of a liquid using a photoelectrocolorimeter.

IV. Independent education and independent work

№	Independent educational topics.	Hours
1	Basics of bionics and its place in human life.	5
2	Elements of hearing biophysics. Fundamentals of cochlear implantation.	5
3	Radio wave surgery	5

4	Biorheology. Viscosity of biological fluids. Use of viscosity in the clinic	5
5	Laminar and turbulent flows. Reynolds number.	5
6	Surface tension of liquids. Air and gas embolism	5
7	Electric and magnetic fields and their effect on living organisms.	5
8	Physical basis of electrography methods (EEG, EMG)	5
9	Low and high frequency physiotherapeutic devices. The physical basis of their operation.	5
10	The law of refraction and reflection of your light. Application of refractometric methods in the practice of medical diagnosis.	5
11	Optical system of the eye and its physical properties.	5
12	Use of endoscopic methods in medicine	5
13	Application of laser in medicine.	3
14	Physical processes in biological membranes.	3
15	Computed tomography and the physical basis of its operation	3
16	Physical basis of magnetic resonance imaging	3
17	Positron emission tomography	3
Total:		**75**

The student should know:

• Goals and tasks of biophysics of the human organism;
• The importance of the biophysics module in the work of a general practitioner;
• general physical and biophysical laws underlying the activity of body organs and tissues;
• mechanical, bioelectric and optical properties and characteristics of body tissues and fluids,
• to have an idea about the main biophysical mechanisms of the physical healing and negative effects of the external environment; (knowledge)
• application of physical laws to processes in a living organism;
• importance of mechanical properties of biological tissues in medicine;
• auditory system and methods of checking it;
• to determine the viscosity of biological fluids;
• know how to work independently with scientific literature and be able to use them; (skill).
• Obtaining, recording and analyzing medical and biological data with the help of physical and technical devices;
• full mastery of biophysical terminology, knowledge of mechanical properties of biological tissues;
• to know the viscosity of biological fluids and the importance of viscosity in the body;
• to know the physical basis of blood pressure determination;

• to learn to determine air humidity, to know the effect of humidity on the body;
• study of thermoelectric phenomena, study of thermocouple leveling;
• to know the phenomenon of light diffraction
• readiness to use the medical equipment and technical means provided for the provision of medical care. must have skills. (qualification).

VII. Educational technologies and methods

• Interactive games;
• Seminar (logical thinking, quick questions and answers;
• Work in groups;
• Introduction of presentations;
• Individual projects;
• Projects for teamwork and advocacy.

VIII. Requirements for obtaining loans.

Successful completion of tasks and assignments given in the current control form.

Information about the types of control and evaluation criteria for the module will be announced to students in the first session of the module.
The following types of control are conducted in order to ensure the compliance of the students' mastery of the module with the State educational standards:
- current control (CC);
- final control (FC).

Student knowledge is 100 points based on the criteria presented in the table below evaluated in the system

Score	level	Equivalent score	Mark	Criteria
90-100	A	5	Excellent	The student makes an independent conclusion and decision, can think creatively, observe independently, put into practice the knowledge received, understand the essence of Science (Subject), know,Express, tell, have an idea of science (subject

85-89	B+	4	Very good	The student makes an independent conclusion and decision, observes independently, is able to apply the knowledge received in practice, understands the essence of science (subject), knows, can express, tell, has an idea of science (subject)
71-84	B	4	good	The student observes independently, is able to put into practice the knowledge received, understands the essence of science (subject), knows, can express, tell and has an idea of science (subject)
60-70	C	3	Satisfying	The student is able to put into practice the knowledge received, understand the essence of the subject (subject), know, Express, tell and have an idea of the subject
0-59	F	2	Unsatisfactory	The student has not mastered the science program, does not understand the essence of science (subject), does not have an idea of science (subject)

Basic literature:

1. Bazarbayev M.I., Mullajonov I. va boshq. Biofizika, Darslik. Toshkent. 2021
2. Remizov A.N. Tibbiy va biologik fizika, Darslik. Toshkent, 2005 y.
3. Ремизов А.Н. Медицинская и биологическая физика, Учебник.2016 г.

4. Additional literature

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1. Антонов В.Ф., Черныш А.М., Козлова Е.К., Коржуев А.В. Физика и биофизика, Учебное пособие. Москва. 2012 г.
2. В.Н. Федорова, Е.В. Фаустов. Медицинская и биологическая физика. курс лекций с задачами, Учебное пособие. Москва. 2008 г.
3. Антонов В.Ф. Биофизика, Учебник. Москва. 2006г.

1. **Websites:**

2. http://www.medbiophys.ru/
3. http://www.biophys.msu.ru/
4. http://biophysics.spbstu.ru/useful_links
5. http://medulka.ru/biofizika
6. http://www.library.biophys.msu.ru/
7. http://www.bio.fizteh.rr/
8. http://Iibrary.ttatf.uz
9. https://t.me/ttatf

MODULE SYLLABUS

Full name	**Biophysics**	
code: BF1104	Credit - 5	Module transition period: 1st semester
Course of Study	60910200- General medicine	1st stage bachelors
Duration of the module	12 week	
Amount of study hours:	Total Hours:	120
	Also:	
	lecture	14
	practical training	61
	laboratory training	
	independent education	75
Status of the training module	Pre-clinical modules	
IHE name, address	Termiz Branch of Tashkent Medical Academy, 69 I. Karimov St., Termiz City	
Department name	Social and humanitarian sciences	
Information about the teachers of this course	Speaker Teachers of practical training and laboratory training **U.M.Abdujabbarova**	E-mail:abdujabbarova12@mail.ru
Time and place of training	Based on the lesson schedule, TTA Termiz branch, 1st educational building, 4th floor, room 403	According to the lesson schedule
Content of the module	In the current era of accelerated scientific and technical progress, reform of the higher education system, improvement of the quality of education in higher educational institutions, in particular, to increase the quality and efficiency of the educational process in medical universities, to strengthen the theoretical knowledge, professional skills and abilities of the specialists being trained. directed. Biophysics is important in imparting theoretical and practical knowledge necessary for the correct interpretation of physiological processes in the functioning of organs and systems in the body in future specialists,	

	showing the primacy of biophysical changes on the basis of the processes of the emergence of any disease. is considered
Prerequisites	It is based on the knowledge obtained from the modules of biological chemistry, medicinal chemistry, human anatomy and histology
Postrequisites	This module is the basis for mastering modules in normal physiology, pathological physiology, pathological anatomy, pharmacology, therapy, surgery, traumatology, urology, obstetrics-gynecology, neurology and other clinical areas.
Purpose of the module	Instilling theoretical and practical knowledge necessary for the correct interpretation of physiological processes in the activity of organs and systems in the body to future specialists, biophysical death based on the processes of the appearance of various diseases in the organs and tissues of the body is to show the primacy of changes.
Tasks of the module	The importance of physical and biophysical laws in the functioning of the organizational parts of the human body and the study of the general physical and biophysical laws underlying the activity of the organs and tissues of the body, the study of the mechanical, bioelectrical and optical properties of the body's tissues and fluids, to understand the unity of their physiological state and anatomical structure in terms of the unity of content and function, to have ideas about the main biophysical mechanisms of the physical healing and negative effects of the external environment.
Requirements for students' knowledge, skills and qualifications for the module	At the end of the semester A student should have an idea of: - He should know the general physical and biophysical laws underlying the activity of the body's organs and tissues, the mechanical, bioelectrical and optical properties and characteristics of the body's tissues and fluids, the main biophysical mechanisms of the physical healing and negative effects of the external environment; - must have the skills to apply physical laws to the processes of a living organism. - should have the skills to receive, record and analyze medical biological data using physical and technical devices The student must know: - Physical quantities and their units; - Measuring instruments and their measurement accuracy; - Obtaining medical biological information and its statistical analysis; - The theory of errors; - Physical properties of biological tissues; - Viscosity of biological fluids, effect of changes in viscosity on the body; - Physical foundations of heart activity; - The physical basis of determination of arterial pressure; - Sound and its use in medicine; - Thermodynamics of living systems; - Electric and magnetic properties of the organism; - The effect of alternating current on the body; - The effect of constant current on the body; - Optical system of the eye; - Lenses and their properties;

	- Use of optical laws in medicine; - Basics of radioactivity; - Effects of ionizing radiation on the body; - The physical basis of the use of ionizing radiation in medicine; - Visualization-based diagnostic methods in medicine. The student should have the following skills: - Complete mastery of biophysical terminology; - Knowing the mechanical properties of biological tissues; - To know the viscosity of biological fluids and the importance of viscosity in the organism; - To know the physical basis of determining blood pressure; - Learning to determine air humidity. - Knowing the effect of moisture on the organism.
Teaching methods	lecture practical training laboratory work
Supply	Textbooks, handouts, modern information communication tools, computers, computer networks, tests, situational problems, study guides.