



Human anatomy and physiology

Working program of basic discipline (Silabus)

Requisites for basic discipline

Level 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>
Discipline status	<i>Mandatory discipline</i>
Form of study	<i>full-time / day / mixed / remote</i>
Year of preparation, semester	<i>1 course (autumn semester, spring semester)</i>
The scope of discipline	<i>8,5 ECTS credits / 255 hours</i>
Semester control / Control measures	<i>Test Work, Modular Test Work, abstract work, exam</i>
Lessons schedule	<i>According to the schedule on the site http://rozklad.kpi.ua/</i>
Language of instruction	<i>English</i>
Information about course leader / teachers	<i>Lecturer: Associate Professor, Ph.D. Bespalova Olena Yaroslavivna e-mail: http://bi.fbmi.kpi.ua/uk/bespalovaua/, o.bespalova@kpi.ua</i> <i>Practical: Associate Professor, Ph.D. Bespalova Olena Yaroslavivna e-mail: http://bi.fbmi.kpi.ua/uk/bespalovaua/, o.bespalova@kpi.ua</i>
Course placement	<i>Platform «Sikorsky» - https://do.ipk.kpi.ua</i>

Distribution of hours

Semester	Lectures	Practical	Laboratory	Independent Work
<i>autumn semester</i>	<i>36</i>	<i>36</i>	<i>0</i>	<i>48</i>
<i>spring semester</i>	<i>36</i>	<i>36</i>	<i>0</i>	<i>63</i>

Curriculum of the discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

The main purpose of the discipline "Human Anatomy and physiology" is the formation of students' theoretical knowledge and the acquisition of practical skills and abilities to use professional medical terminology in educational, scientific and industrial activities.

The main focus is on the formulation of professional and terminological competence of students, focused on the educational medical thermosystem. Human anatomy and physiology is one of the basic sciences, both for medicine and for biology and bioengineering. Knowledge of human anatomy and physiology will form a bioengineering view of the implementation of information processes in the structure and function of cells, tissues, organs and physiological and anatomical systems of the human body, which will solve engineering problems related to the interaction between living and inanimate systems.

experience:

- apply Latin anatomical, histological, clinical, medical and technical terms;
- read the terms in Latin, that is, translate them;
- to form a bioengineering view on the implementation of information processes in the structure and function of cells, tissues, organs and physiological and anatomical systems of the human body;
- basics of structure and function of corresponding physiological and anatomical systems of an organism and their application at creation, design and engineering service of biological and medical devices and systems;
- to evaluate and use bioelectric phenomena, the nature of the potentials of the human body and its separate structures and their role in the information processes of the human body in assessing the state of health and its correction.

General competencies

GC 1- Ability to apply knowledge in practical situations.

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

GC 3 -Ability to communicate in the state language both orally and in writing.

GC 4 -Skills in the use of information and communication technologies.

GC 5 -Ability to perform research at the appropriate level.

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

GC 7- Ability to generate new ideas (creativity).

GC 8 -Ability to make well-grounded decisions.

GC 9 -Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity).

GC 10 - Safe activities skills.

Special (professional) competencies

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 5- Ability to apply physical, chemical, biological and mathematical methods in the analysis, modeling of the functioning of living organisms and biotechnical systems.

PC 8- Ability to perfect research and observations on the interaction of biological, natural and artificial systems (prostheses, artificial organs, etc.).

PC13 - Ability to provide and monitor compliance with safety and biomedical ethics when working with medical equipment.

The program learning outcomes after studying the discipline " Human anatomy and physiology" are

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

PLO 5- Knowledge of research methods and techniques used in the design of medical equipment.

PLO 14- Possession of tools for experimental research (medical devices, biomaterials for medical purposes).

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 23- Knowledge of universal principles of complex biological systems structure, including the human body.

PLO 24- Apply knowledge of the basics of mathematics, physics and biophysics, bioengineering, chemistry, engineering graphics, mechanics, resistance and strength of materials, properties of gases and liquids, electronics, computer science, obtaining and analyzing signals and images, automatic control, systems analysis and decision making methods at the level required to solve the problems of biomedical engineering.

PLO 29- Professional communication with healthcare professionals in the state and foreign languages (English or one of the other official EU languages) and understanding of their requirements for biomedical products and services

PLO 32- Understanding of theoretical and practical approaches to creation and application of artificial biological and biotechnical objects and materials of medical appointment.

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

Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

The discipline " Human anatomy and physiology " belongs to the cycle of professional training and has an interdisciplinary nature. It integrates knowledge from other disciplines according to its subject: anatomy, biology, etc. The acquired practical skills and acquired theoretical knowledge during the study of the discipline "Human anatomy and physiology" can be used later in the mastering of the discipline: "Quantitative Physiology".

2. The content of the discipline

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

Section 1. Fundamentals of Medical Terminology

Subject 1.1. History of Creation of Medical Terminology

Subject 1.2 Ways to create medical terms.

Subject 1.3 Ways of Formulating Medical Terminology Using Latin and Greek Termoelements

Section 2. Medical and technical terminology

Subject 2.1. Origin and lexical composition of medical terminology. Sources of borrowing

Subject 2.2 Prefix-suffixing method of creating medical terms

Subject 2.3 Formation of medical terms in a suffixal way to denote anatomical concepts, organs,

Subject 2.4 Terminological element as a component of medical terminology. Clinical term elements.

Subject 2.5 Word formation in clinical terminology. Medical - technical terminology.

Section 3. Anatomical terminology

Subject 3.1 Structure of anatomical terms

Subject 3.2 Terms for designating organ systems, organs and their parts.

Subject 3.3 Terms for human tissues

Subject 3.4 Terms of the musculoskeletal system

Subject 3.5 Terms of the nervous system and the general structure of the nervous system.

Subject 3.6 Anatomical terminology and general structure and principles of work of sense organs: organ of sight, organ of hearing.

Subject 3.7 Anatomical terminology and general structure of the cardiovascular system

Subject 3.8 Anatomical terminology and the general structure of the digestive system.

Subject 3.9 Anatomical terminology and the general structure of the respiratory system.

Subject 3.10 Anatomical terminology and the general structure of the excretory system

Section 4. Human anatomy

Subject 4.1 Introduction to human anatomy.

Subject 4.2 General characteristics and classification of tissues

Subject 4.3 The musculoskeletal system of man

Subject 4.4 Sensory and regulatory functions

Subject 4.5 Anatomy of the cardiovascular and lymphatic systems

Subject 4.6 Anatomy of the digestive system

Subject 4.7 General anatomy of the respiratory system

Subject 4.8 General anatomy of the urinary system

Subject 4.9 Anatomy of the human endocrine and reproductive systems

Section 5. Normal physiology

Subject 5.1 Bioelectrical phenomena in excitable tissues, neuro-humoral regulation

Subject 5.2 Physiological regulation of body functions and its types by the method of information transfer

Subject 5.3 Neurophysiology

Subject 5.4 Physiology of sensory systems

Subject 5.5 Physiological blood system

Subject 5.6 Physiological circulatory system

Subject 5.7 Physiological respiratory system

Subject 5.8 Physiological digestive system

Subject 5.9 Physiological system of selection

3. Training materials and resources

Basic literature:

1. Tom L. Beauchamp and James F. Childress *Principles of Biomedical Ethics Seventh Edition* 2013.- 480 p

2. *Introduction to medical terminology engage Learning.* - APPA_Printer. indd 2010.-227 p
3. *Human Anatomy Atlas – 2014.-1559 p.*
4. *Латинский язык и основы медицинской терминологии: учебно-методическое пособие под общ. ред. Д.К. Кондратьева .- Гродно: ГрГМУ, 2011.- 320 с.*
5. *Основи анатомії та фізіології людини: Навчальний посібник для практичних робіт з кредитного модуля дисципліни «Анатомія та фізіологія людини-2. Основи анатомії та фізіології людини» для здобувачів ступеня бакалавра спеціальності 163 «Біомедична інженерія»]: навчальний посібник для студ. спеціальності 163 «Біомедична інженерія» / КПІ ім. Ігоря Сікорського: уклад. О.Я. Беспалова. – Київ : КПІ ім. Ігоря Сікорського, 2021. – 63 с.*

Additional literature:

1. *Frank H. Netter Atlas of Human Anatomy Including Student Consult eBook/Paperback.- 2017.-1357 p.*
2. Кравчук С. Ю. /Анатомія людини.. – Чернівці, 2007. – 600 с.: [іл.http://www.booksmed.com/luchevaya-diagnostics/2216-vrachebnye-metody-diagnostics-ukes.html](http://www.booksmed.com/luchevaya-diagnostics/2216-vrachebnye-metody-diagnostics-ukes.html)
3. *Новий російсько – українсько - англійський тлумачний словник з інформатики. Основні терміни: близько 3300 термінів/ Уклад.: М.Д. Гінзбург, Л.І. Білоусова, І.М. Корніловська та ін. За ред. М.Д. Гінзбурга. – Харків: Корвін, 2002. –656 с.*
4. Шевченко Є.М. Латинська мова й основи медичної термінології / Шевченко Є.М. - Київ: Тандем, 2001. – 176 с.
5. Коляденко Г.І. Анатомія людини: Підручник для вузів. – К.: Либідь, 2001. -380с.
6. Сидоренко П.І. Анатомія та фізіологія людини. – К.: Медицина, 2011. – 248с.

Educational content

4. Methods of mastering the discipline (educational component)

№ s/n	Subject	Program learning outcomes	The main tasks	
			Control measure	Deadline
<i>Autumn semester, 4. ECTS credits / 120 hours</i>				
1.	History of Creation of Medical Terminology	PLO1 PLO 5	Practical work 1	1st week
2.	Ways to create medical terms.	PLO 1 PLO 5	Practical work 2	2nd week
3.	<i>Ways of Formulating Medical Terminology Using Latin and Greek Termoelements</i>	PLO14 PLO 17	Practical work 3	3rd week
4.	<i>Origin and lexical composition of medical terminology. Sources of borrowing</i>	PLO 14 PLO17	Practical work 4	4th week
5.	<i>Prefix-suffixing method of creating medical terms</i>	PLO 1 PLO 5 PLO 21	Practical work 5	5th week
6.	Formation of medical terms in a suffixal way to denote anatomical concepts,	PLO5 PLO 29	Practical work 6	6th week

	organs,			
7.	Terminological element as a component of medical terminology. Clinical term elements.	PLO5 PLO 29	Practical work 7	7th week
8.	Word formation in clinical terminology. Medical - technical terminology.	PLO5 PLO 29	Practical work 8	8th week
9.	Structure of anatomical terms	PLO1 PLO 29	Practical work 9	9th week
10.	Terms for designating organ systems, organs and their parts.	PLO14 PLO 29	Practical work 10	10th week
11.	Terms for human tissues	PLO5 PLO 23	Practical work 11	11th week
12.	Terms of the musculoskeletal system	PLO5 PLO 23	Practical work 12	12th week
13.	Terms of the nervous system and the general structure of the nervous system.	PLO5 PLO 23	Practical work 13	13th week
14.	Anatomical terminology and general structure and principles of work of sense organs: organ of sight, organ of hearing.	PLO5 PLO 24	Practical work 14	14th week
15.	Anatomical terminology and general structure of the cardiovascular system	PLO5 PLO 23	Practical work 15	15th week
16.	Anatomical terminology and the general structure of the digestive system.	PLO1 PLO 32	Practical work 16	16th week
17.	Anatomical terminology and the general structure of the respiratory system.	PLO5 PLO 23	Practical work 17	17th week
18.	Anatomical terminology and the general structure of the excretory system	PLO 17 PLO 43	Practical work 18	18th week
19.	Abstract work	PLO1 PLO 14 PLO 17 PLO 24	Registration and submission of work	16-17th week
20.	Modular control work		Practical work 18	18th week
21.	Exam			
<i>Spring semester, 4.5 ECTS credits / 135 hours</i>				
1.	Introduction to human anatomy.	PLO1 PLO 5 PLO 14	Practical work 1	1st week

2.	General characteristics and classification of tissues	PLO 17 PLO 23 PLO 24	Practical work 2	2nd week
3.	The musculoskeletal system of man	PLO 5 PLO 23	Practical work 3	3rd week
4.	Sensory and regulatory functions	PLO 1 PLO 23 PLO 5	Practical work 4	4th week
5.	Anatomy of the cardiovascular and lymphatic systems	PLO 5 PLO 17 PLO 23	Practical work 5	5th week
6.	Anatomy of the digestive system	PLO 5 PLO 6 PLO 8	Practical work 6	6th week
7.	General anatomy of the respiratory system	PLO 23 PLO 29 PLO 32	Practical work 7	7th week
8.	General anatomy of the urinary system	PLO 5 PLO 32 PLO 43	Practical work 8	8th week
9.	Anatomy of the human endocrine and reproductive systems	PLO 5 PLO 23	Practical work 9	9th week
10.	Bioelectrical phenomena in excitable tissues, neuro-humoral regulation	PLO 14 PLO 24	Practical work 10	10th week
11.	Physiological regulation of body functions and its types by the method of information transfer	PLO 17 PLO 23	Practical work 11	11th week
12.	Neurophysiology	PLO 5 PLO 29	Practical work 12	13-14th week
13.	Physiology of sensory systems	PLO 21 PLO 23	Practical work 13	13th week
14.	Physiological blood system	PLO 24 PLO 29	Practical work 14	14th week
15.	Physiological circulatory system	PLO 17 PLO 23	Practical work 15	15th week
16.	Physiological respiratory system	PLO 5 PLO 17	Practical work 16	16th week
17.	Physiological digestive system	PLO 14 PLO 17	Practical work 17	17th week
18.	Physiological system of selection	PLO 5 PLO 43	Practical work 18	18th week

19.	Abstract work	PLO 5 PLO 21 PLO 24 PLO 43	Registration and submission of work	16-17th week
20.	Modular control work		Practical work 18	18th week
21.	Exam			

5. Independent student work

One of the main types of semester control during the mastering of the discipline " Human anatomy and physiology " is the implementation abstract work. Abstract work is performed in accordance with the requirements, within the period specified by the teacher.

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

Approximate topics of the abstracts:

1. Characteristics and classification of tissues.
2. The musculoskeletal system.
3. Anatomy of the cardiovascular and lymphatic systems.
4. Physiology of the nervous system.
5. Physiological system of blood circulation
6. Basic Structure and Function of the Nervous System. Types of Neurons. Glial Cell Types by Location and Basic Function.
7. Basic Structure and Function of the Nervous System. The Action Potential.
8. Basic Structure and Function of the Nervous System. Sensory Perception.
9. Functions of the Integumentary System.
10. Structures of the Endocrine System and Function.
11. The urinary system. Renal Hilum.
12. Physiology of Urine Formation. Glomerular Filtration Rate.
13. The urinary system. Tubular Reabsorption.
14. Divisions of the Autonomic Nervous System.

The title page of the abstract work 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 abstract 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 abstract work, which should 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.

Mandatory requirement: clear reference to sources of information. All figures, facts, opinions of scientists, quotations, formulas should have a reference in the form [2, p. 54] (the first digit means the number of the source in the list of references given at the end of the creative work, and the second digit - the page number in this source). It is desirable to use tables, diagrams, graphs, charts, etc. The list of used sources (not less than 10 sources) is made out according to operating rules. If the information is

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.

Deadline for submission abstract work for verification: 16-17th week of study.

Policy and control

6. Policy of academic discipline (educational component)

Attending classes

Attendance at lectures is optional. Attending practical classes is desirable, as they are used to write express tests / tests, as well as to defend practical work.

The grading system is focused on obtaining points for student activity, as well as performing tasks that are able to develop practical skills and abilities.

Control measures missed

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

Omissions of writing a module test and express test are not fulfilled.

Abstract work, which is submitted for inspection in violation of the deadline is evaluated with a decrease in the number of weight points.

Violation of deadlines and incentive points

Encouragement points		Penalty points *	
Criterion	Weight points	Criterion	Weight points
<i>Improving practical work</i>	<i>1 points (for each practical work)</i>	<i>Untimely implementation and test of practical work</i>	<i>From -0.5 points to -5 points (depending on the delivery date)</i>
<i>Passing distance courses on topics that are agreed with teachers</i>	<i>5 points</i>	<i>Untimely execution and test of calculation and graphic work</i>	<i>From -2 points to -20 points (depending on the construction period)</i>
<i>Registration of scientific work for participation in the competition of student scientific works</i>	<i>10 points</i>		
<i>Writing abstracts, articles, participation in international, national and / or other events or competitions on the subject of the discipline</i>	<i>5 points</i>		

* 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 discipline " Human anatomy and physiology " can be taught to most students with special educational needs, except for students with severe visual impairments who do not allow to perform tasks using personal computers, laptops and / or other technical means.

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, and also performance of settlement and abstract work, 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).

Learning 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.

7. Monitor and evaluate the system of evaluation of learning outcomes (Rating System of Evaluation)

Evaluation system (current control):

1. Autumn semester, 4.0 ECTS credits / 120 hours

No s/n	Control measure	%	Weight points	Number	Total
1.	Execution and test of practical works	34	2	17	34
2.	Modular control work(MCW)	16	16	1	16
3.	Abstract work	10	10	1	10

4.	Exam	40	40	1	40
<i>Total</i>					100

2. Spring semester, 4.5 ECTS credits / 135 hours

No s/n	Control measure	%	Weight points	Number	Total
1.	Execution and test of practical works	34	2	17	34
2.	Modular control work(MCW)	16	16	1	16
3.	Abstract work	10	10	1	10
4.	Exam	40	40	1	40
<i>Total</i>					100

The applicant receives a positive credit score for the results of the semester, if he has a final rating for the semester of at least 30 points and has met the conditions of admission to the semester control, which are determined by the RSE (Rating System of Evaluation).

With applicants who have met all the conditions of admission to the test and have a rating of less than 60 points, as well as with those applicants who want to increase their rating, in the last scheduled lesson in the semester, the teacher conducts semester control in the form of test or interviews.

After performing the test, if the score for the test is higher than the rating, the applicant receives a score based on the results of the test.

If the grade for the test is lower than the rating, a "hard" RSE is used - the previous rating of the applicant (except for points for the semester individual task) is canceled and he receives a grade based on the results of the test. This option forms a responsible attitude of the applicant to the decision to perform the test, forces him to critically assess the level of his training and carefully prepare for the 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.

Criterion		The first CC	The second CC	
Deadline of calendar controls		8th week	14th week	
Current rating		≥ 24 points	≥ 40points	
Conditions for obtaining a positive result from the calendar control	Execution practical work	PW № 1- 8	+	
		PW № 9-16	-	
	Express control works / test tasks	At least 4 of any lectures	+	-
		At least 8 of any lectures	-	+
	Modular control work	Estimated MCW	-	+
Abs tract work	Estimated CGW	-	-	

In case of detection of academic poor quality during training - the control measure is not credited.

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

Optional conditions for admission to closure:

- 1. Activity in practical classes.*
- 2. Positive result of the first attestation and the second attestation.*
- 3. Attending 50% of lectures.*

Table of translation of rating points to grades on a university scale:

<i>Number points</i>	<i>Assessment on the university scale</i>
<i>100-95</i>	<i>Excellent / Відмінно</i>
<i>94-85</i>	<i>Very good / Дуже добре</i>
<i>84-75</i>	<i>Good / Добре</i>
<i>74-65</i>	<i>Satisfactorily / Задовільно</i>
<i>64-60</i>	<i>Sufficient Enough / Достатньо</i>
<i>Less 60</i>	<i>Unsatisfactorily / Незадовільно</i>
<i>Admission conditions are not met</i>	<i>Not allowed / Не допущено</i>

8. Additional information on the discipline (educational component)

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).

Work program of the discipline (syllabus):

Compiled by Associate Professor of Translational Medical Bioengineering Ph.D. **Bespalova Olena Yaroslavivna**

Approved by the Department of Translational medical bioengineering (protocol № 15 from 19.06.2021)

Approved by the Methodical Commission of the Faculty of Biomedical Engineering (protocol № __ to _____)