National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

Department of Biomedical Engineering

INTRODUCTION TO THE PROFESSION

Working program of Elective discipline (Course Syllabus)

Course Details	
Level of higher education	***First (bachelor's) level***
Field of study	*16 Chemical and Bioengineering*
Specialty	*163 Biomedical Engineering*
Educational program	*Medical Engineering, Regenerative and Biopharmaceutical Engineering*
Course status	*Regulatory*
Mode of study	*full-time (daytime)*
Year of study / semester	*1st year, fall semester*
Course workload	*4 ECTS credits / 120 hours*
Forms of assessment	*Pass/fail test, modular assessment test, individual written assignment (Home test)*
Course schedule	*According to the schedule on the website http://rozklad.kpi.ua/*
Language of instruction	*Ukrainian*
Course Instructor(s)/ Instructor profile	***Lecturer:*** *Doctor of Medical Sciences , Professor of the Department of BMI Maksymenko Vitaliy Borisovich, e- mail – maksymenko.vitaliy@gmail.com. Candidate of Biological Sciences , Associate Professor of the Department of BMI Kalashnikova Larisa Yevheniivna, e- mail – doc_hom2000@yahoo/ com* ***Practical:*** *, Candidate of Biological Sciences , Associate Professor of the Department of BMI Kalashnikova Larisa Yevheniivna, e- mail – doc_hom2000@yahoo/ com Senior lecturer Ovcharenko Ganna Romanivna, e- mail – ovcharenko.ganna@lll.kpi.ua*
Course Delivery Platform	*Sikorsky Platform - Course "Introduction to the Profession"*

Course Programme				
semester	**Lectures**	***Practical***	***Laboratory***	***Independent work***
fall semester	*36*	*36*		*48*

Academic discipline program

1. Course Description, Aim, Subject Matter and Learning Outcomes

*Educational discipline **"Introduction to the profession"** belongs to the cycle of normative academic disciplines of professional training. It is designed for first-year bachelors who do not have a systematic idea of the specialty.*

Biomedical engineering has more than 18 specializations that are generally recognized by leading educational institutions. Understanding them is a necessary component of determining the role and place of a future graduate in the education system and in the labor market. Biomedical engineering arose at the intersection of humanities and engineering disciplines. It requires a deep understanding of biological and technical sciences. These challenges require the training of engineers capable of interdisciplinary cooperation at every stage of research, development, operation of medical devices and related technologies. In accordance with international educational programs, the theoretical content of

the disciplines includes the main problems at the intersection of engineering and medical science, including: the evolution of medical equipment, a deep understanding of the principles of engineering technologies in the field of healthcare, the basics of their management and quality standards.

The discipline "Introduction to the profession" introduces students to the legislative and regulatory framework of the profession, offers for further in-depth study the basic tools necessary at the beginning of training for searching and processing educational information, its comprehension and presentation. The practical part is aimed at solving the problems of analyzing information sources, modeling and planning research, understanding the terminological base of medicine and biology, technologies and methods of preparing scientific reports, articles, presentations.

***The purpose of the discipline** : the formation of a medical and engineering worldview based on generalized and systematized basic knowledge to train specialists capable of applying knowledge in practical situations, understanding the subject area of professional activity, using information and communication technologies, processing and analyzing information from various sources, identifying, formulating and solving engineering problems related to the interaction between living and non-living systems.*

The training is carried out on the basis of a modern strategy of interaction between the teacher and the student in the electronic space with the aim of assimilating the material by the students and developing their practical skills. During the training, the method of educational discussion, scientific research, modeling and simulation of processes and systems is used.

For more effective communication in order to understand the structure of the academic discipline and

The following platforms are used to learn the material: https://do.ipo.kpi.ua and https://classroom.google.com/, through which:

- the placement and exchange of educational material is simplified;

- feedback is provided to students regarding learning tasks and

the content of the academic discipline;

- students' learning tasks are assessed;

- records are kept of students' implementation of the academic discipline plan and implementation schedule

learning tasks and student assessment.

***Integral competence** (OP put into effect by the Rector's Order NOD/434/24 dated 06/10/2024):*

***IC** - The ability to solve complex, specialized problems and practical problems in biomedical engineering and in the process, which provides the use of specific theories and methods of chemical, biological and medical engineering, and is characterized by the complexity and non-strict terms.*

***General competencies** (OP put into effect by the Rector's Order NON/434/24 dated June 10, 2024):*

GC 02 Knowledge and understanding of the subject area and understanding of professional activities.

GC 06 Ability to search, process, and analyze information from various sources.

***Professional competencies** (OP put into effect by the Rector's Order NOD/434/24 dated June 10, 2024):*

PC 09 Ability to identify, formulate, and solve engineering problems related to the interaction between living and non-living systems.

PC 12 Ability to ensure and monitor compliance with safety and biomedical ethics when working with medical equipment.

***Program learning outcomes** after studying the discipline "Introduction to the profession" is (OP put into effect by the Rector's Order NON/434/24 dated 10.06.2024):*

PLO 18 Understanding of fundamental-applied, medical-physical, and physico-chemical principles governing the functioning of biological objects, as well as bioengineering fundamentals of technologies and equipment for researching human body processes.

PLO 24 Being able to consider historical, social, environmental, ethical, legal, economic aspects, requirements of labor protection, industrial hygiene, and fire safety when forming technical solutions, taking into account the strengthening and preservation of personal and public health.

2. Prerequisites and Postrequisites of the Course (place within the structural and logical framework of the educational programme)

The discipline "Introduction to the profession" is a normative discipline belonging to the cycle of professional training and has an interdisciplinary character. It is the foundation for understanding the role and place of other disciplines in the education of a biomedical engineer, integrates, according to its subject, the basic characteristics and definitions of other educational and scientific branches of the profession. According to the structural and logical scheme of the bachelor's training program, it is closely related to other disciplines of the professional and general blocks: Biophysics, Anatomy and Physiology, Fundamentals of a healthy lifestyle, Introductory practice in medical engineering, Radiation safety and dosimetry, Design of biomedical systems.

3. Course Content

The main sections and topics that will be covered during the course:

Chapter 1. The Biomedical Engineering Paradigm

Topic 1.1. History of the formation of biomedical engineering in Ukraine and the world.

Topic 1.2. Development of NBIC technologies in the global healthcare system. Forecast of the development of biomedical engineering.

Topic 1.3. Peculiarities of scientific work in the field of biomedical engineering, current trends and problems.

Topic 1.4. Fundamentals of scientific publication. Fundamentals of scientific report and educational discussion

Topic 1.5. The concept of training specialists in the field of biomedical engineering in Ukraine and the world.

Topic 1.6. Specifics of the professional activities of a biomedical engineer in the healthcare system, in industry, and in science.

Topic 1.7. Engineering aspects of biomedical technologies. Classification of technologies and tools of biomedical engineering.

Topic 1.8. Clinical, medical engineering, medical physics, biomechanics, robotics

Topic 1.9. IT technologies in healthcare, telemedicine, medical imaging, bioinformatics

Topic 1.10. Rehabilitation, orthopedic and sports biomedical engineering, disaster medicine

Topic 1.11. Tissue, cell, genetic engineering, multiomics , biotechnology, translational bioengineering

Topic 1.12. Nanotechnology, nanomaterials , nanosensors , Bio -MEMS, neuroengineering , biohacking

Chapter 2. Biomedical ethics.

Topic 2.1. Bioethics: its subject, status and range of problems. Ethics of relations in the "doctor-patient" system

Principles and rules of biomedical ethics

Topic 2.2. Moral aspects of conducting biomedical research and experiments on humans and animals

Topic 2.3. "Open" problems of biomedical ethics.

4. Learning Materials and Resources

Basic literature:

1. Higher education standard in specialty 163 Biomedical Engineering

Access mode *: https://bmi.fbmi.kpi.ua/department/standards-higher-education/*

2. Educational programs of the first (bachelor's) level of higher education of the corresponding year of study

Access mode *: https://osvita.kpi.ua/163*

3. REGULATIONS ON THE ORGANIZATION OF THE EDUCATIONAL PROCESS AT IHORY SIKORSKI KPI / Ministry of Education and Science of Ukraine, NTUU "KPI". Kyiv, 2020. – 17p.

Access mode *: https://document.kpi.ua/files/2020_7-124.pdf*

4. Chronology of the development of medical and engineering specialties in the education system of Ukraine and the formation of biomedical engineering / V. B. Maksymenko, et al. // Current state and prospects of biomedical engineering: materials of the International scientific and practical conference dedicated to the 20th anniversary of the Faculty of Biomedical Engineering of the Igor Sikorsky Kyiv Polytechnic Institute (15-16.12.2022, Kyiv): electronic collection / Compiled by : O.I. Golembiovska – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2022. – pp. 83-94

Access mode: *https://elartu.tntu.edu.ua/handle/lib/39548*

5. Vazhinsky S.E., Shcherbak T.I. Methodology and organization of scientific research: Textbook. / S. E. Vazhinsky , T.I. Shcherbak. – Sumy: SumSPU named after A.S. Makarenko, 2016. – 260 p.

Access mode: *https://nuczu.edu.ua/sciencearchive/Articles/gornostal/vajinskii%20posibnyk.pdf*

6. Ovcharenko G. R. Introduction to the profession. Educational materials for independent and distance learning / G. R. Ovcharenko, L. E. Kalashnikova. – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2021. – 72 p.

Access mode: *https://drive.google.com/file/d/1SxeuoqQh2fe6mLk-IcbyVWqDo9vAfMsO/view?usp=sharing*

Additional literature:

1. *Fundamentals of scientific research: teaching manual / edited by T. V. Goncharuk. — Ternopil, 2014. — 272 p.*

Access mode: *http://dspace.wunu.edu.ua/bitstream/316497/4874/3. MANUAL%20OND%20print.pdf*

2. Order of the Ministry of Health of Ukraine dated January 22, 2020 No. 142 METHODOLOGICAL RECOMMENDATIONS “Classification of medical devices” **Access mode:** https://moz.gov.ua/uploads/3/16105-dn_20200122_142_dod_1.pdf

Course Content

5. Methodology for Studying the Course (Educational Component)

No	*Topic*	*Program learning outcomes*	*Main tasks*	
			Assessment Activity	*Completion Time*
1	*Topic 1.1. History of the formation of biomedical engineering in Ukraine and the world.*		*Practical work 1*	*1st week*
2	*Topic 1.2. Development of NBIC technologies in the global healthcare system. Forecast of the development of biomedical engineering.*		*Practical work 2*	*2nd week*
3	*Topic 1.3. Peculiarities of scientific work in the field of biomedical engineering, current trends and problems.*		*Practical work 3*	*3rd week*
			Practical work 4	*4th week*
			Practical work 5	*Week 5*
			Practical work 6	*Week 6*
			Practical	*Week 11*

No	Topic	Program learning outcomes	Main tasks	
			Assessment Activity	Completion Time
			work 11	
4	Topic 1.4. Fundamentals of scientific publication. Fundamentals of scientific report and educational discussion			4th week
			Practical work 7	Week 7
			Practical work 8	Week 8
			Practical work 9	Week 9
			Practical work 10	Week 10
5	Topic 1.5. The concept of training specialists in the field of biomedical engineering in Ukraine and the world.		-	Week 5
6	Topic 1.6. Specifics of the professional activities of a biomedical engineer in the healthcare system, in industry, and in science.		-	Week 6
7	Topic 1.7. Engineering aspects of biomedical technologies. Classification of technologies and tools of biomedical engineering.		-	Week 7
8	Topic 1.8. Clinical, medical engineering, medical physics, biomechanics, robotics		-	Week 8
9	Topic 1.9. IT technologies in healthcare, telemedicine, medical imaging, bioinformatics		-	Week 9
10	Topic 1.10. Rehabilitation, orthopedic and sports biomedical engineering, disaster medicine		-	Week 10
11	Topic 1.11. Tissue, cell, genetic engineering, multiomics , biotechnology, translational bioengineering		-	Week 11
12	Topic 1.12. Nanotechnology, nanomaterials , nanosensors , Bio -MEMS, neuroengineering , biohacking		-	12th week
13	MODULAR ASSESSMENT TEST 1		Practical work 12	12th week
14	Topic 2.1. Bioethics: its subject, status and range of problems. Application of the foundations of biomedical ethics to solving complex specialized tasks and practical problems in biomedical engineering or in the learning process, characterized by the complexity and uncertainty of conditions		Practical work 13	Week 13
15	Topic 2.1. Bioethics: its subject, status and range of problems. Apply knowledge of the basics of systems analysis for bioethics and biosafety at the level necessary for solving biomedical engineering problems.		Practical work 14	Week 14
16	Topic 2.1. Bioethics: its subject, status and range of problems. Analyze the level of compliance with modern		Practical work 15	Week 15

No	Topic	Program learning outcomes	Main tasks	
			Assessment Activity	Completion Time
	world standards, taking into account the capabilities of modern technical and software tools for automating medical equipment, and review the application of the latest technologies in medical practice. The main tasks in the human-universe system, the main tasks of biomedical ethics. The main tasks of medical ethics and Ethics of relations in the "doctor-patient" system			
17	Topic 2.2. Moral aspects of conducting biomedical research and experiments on humans and animals. The possibility of using artificial dummies for conducting medical experiments, or using bioassays to study the activity of artificial xenobiotics.		Practical work 16	Week 16
18	Topic 2.2. Moral aspects of conducting biomedical research and experiments on humans and animals. Understanding the scientific and technical principles, methods and research methods that form the basis for the development, planning and design of the latest achievements in the biomedical field.			Week 17
19	MODULAR ASSESSMENT TEST 2		Practical work 17	Week 17
20	Topic 2.3. "Open" problems of biomedical ethics.			Week 18
21	Test		Practical work 18 Credit	Week 18

6. Independent Student Work

*One of the main types of semester control during the mastering of the academic discipline **"Introduction to the Profession"** is the completion of homework. Homework is completed in accordance with the requirements, within the time specified by the teacher.*

The main goal of the homework test is to master the material taught in lectures and independently study theoretical material. The student can write a homework test only on a topic agreed with the teacher.

Approximate List of Work:

Modern achievements of biomedical engineering in one of the following areas: clinical, medical engineering, medical physics, biomechanics, robotics, IT technologies in healthcare, telemedicine, medical imaging, bioinformatics , rehabilitation, orthopedic and sports biomedical engineering, disaster medicine , tissue, cell, genetic engineering, multiomics , biotechnology, translational bioengineering, nanotechnology, nanomaterials , nanosensors , Bio -MEMS, neuroengineering , biohacking.

Students independently formulate and agree with the teacher the topic and purpose of the HOME TEST.

The title page of the homework test should have the following content: name of the university; name of the faculty; name of the department; name of the specialty, name of the educational and professional

program, registration number, name of the academic discipline; topic of the homework test; student's last name and first name, course, academic group number, year.

The title page is followed by a literature search performed by the applicant on the selected topic in the form of a report abstract. The total volume of the homework test, depending on the selected topic, should be 2 full pages of the substantive part. The volume of the homework test is determined by the student's ability to briefly and at the same time comprehensively reveal the topic: the relevance of the topic under consideration, current trends and problems, analyze the best foreign and Ukrainian technologies, draw conclusions and substantiate their own proposals and recommendations.

Mandatory requirement: clear reference to sources of information. All figures, facts, opinions of scientists, quotes, formulas must have references in the form of [2]. It is advisable to use tables, diagrams, graphs, charts, etc. The list of sources used (at least 10 sources) is drawn up in accordance with current rules. If the information is taken from the Internet, it is necessary, as for ordinary literature, to indicate the author, the title of the article, and then give the address of the Internet site.

Homework is evaluated according to the following criteria: logical structure of the material; completeness and depth of disclosure of the topic; reliability of the data obtained; display of practical materials and calculation results; availability of illustrations (tables, figures, diagrams, screenshots of web pages, etc.); number of sources used and clarity of references to them; design; substantiation of the student's own opinion on this issue in the form of a conclusion.

Deadline for submitting homework for review: 12th week of study.

Homework is checked for plagiarism using public resources and must meet the requirements of academic integrity. If academic dishonesty is detected, the work is canceled and not checked.

Policy and Control

7. Academic discipline policy (educational component)

Attending classes

Attending lectures is not mandatory. Attending practical classes is desirable, as most of them involve writing express tests/tests, and also defending practical work.

The assessment system is focused on receiving points for student activity, as well as completing tasks that can develop practical skills and abilities.

Missed control measures

Missed control measures (defense of practical works) must be completed in subsequent classes, provided that the task scheduled for the current class is completed, either in consultations, or in asynchronous mode.

Missing module tests and express tests are not processed.

Homework submitted for review after the deadline is evaluated with a reduced number of weighted points.

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". More information: https://kpi.ua/code.

Norms of ethical behavior

The norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". More information: https://kpi.ua/code .

Procedure for appealing the results of control measures

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

The student has the right to appeal the results of the control measure in accordance with the approved regulations on appeals at Igor Sikorsky Kyiv Polytechnic Institute (approved by order No. No. HOH/228/2022 dated 07/21/2022) - https://osvita.kpi.ua/node/182

Inclusive learning

Academic discipline "Introduction to the profession" for most students with special educational needs, except for students with severe visual impairments that prevent them from completing tasks using personal computers, laptops, and/or other technical aids.

Distance learning

Distance learning takes place through the Sikorsky Distance Learning Platform.

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

The list of courses is offered by the teacher after students express their desire (since the bank of available courses is updated almost every month).

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

Practical work, as well as modular test work, can be carried out during independent work of students in remote mode (with the possibility of consulting with the teacher via email, social networks).

Learning in a foreign language

Teaching in English is provided only for foreign students.

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

8. Types of control and rating system for assessing learning outcomes (RSO)

The evaluation of the results of the discipline is carried out on a 100-point scale with mandatory conversion of grades to the university scale (with grades of "excellent", "very good", "good", "satisfactory", "sufficient" or "unsatisfactory").

Evaluation system (current control):

No. salary	Control measure	%	Weighted score	Ring	Total
1.	Practical work No. 1	2	2	1	2
2.	Practical work No. 3-6 Computer workshops	16	4	4	16
3.	Practical work No. 7-10 Report at seminar classes;	16	16	1	16
4.	Active work in practical classes (seminars)	4	1	4	4
5.	Modular test I;	6	6	1	6

6.	Modular test II;	21	21	1	21
7.	Express inspection work	10	2	5	10
8.	Homework test	25	25	1	25
	Total				100
	Credit work[1]	75	75	1	75

In accordance with the rating system for assessing student learning outcomes, the 100-point scale of grades in the discipline is distributed:

Block I – the applicant's points obtained for studying section 1 and amounts to 44 points (items 1-5);

Block II – the applicant's points obtained for studying section 4 and amounts to 31 points (items 6-7);

Block III – the applicant's points obtained for the HOME TEST and amounts to 25 points (point 8);

Calculation of points for practicals No. 3-6 (point 2)

Rating	Evaluation criterion	Points
" Excellent "	At least 95% of the required information. The material was created using modern graphic packages in compliance with the requirements.	4 points
"Very good"	At least 85% of the required information. The material was created using modern graphic packages in compliance with the requirements.	3 points
"Good"	At least 75% of the required information. The material was created using modern graphic packages in compliance with the requirements.	2 points
"Satisfactorily"	At least 65% of the required information. The material was created using modern graphic packages in compliance with the requirements.	1 point
" Sufficient "	At least 60% of the required information. The material was created using modern graphic packages in compliance with the requirements.	0.5 points
" Unsatisfactory "	Does not meet the "Satisfactory" criterion or was submitted after the deadline	0 points

Calculation of points for presentation in seminar classes (item 3)

Rating	Evaluation criterion	Points
" Excellent "	The illustrative material (presentation) fully, with high clarity, reveals the main provisions of the work presented in the report. The material was created using modern graphic packages in compliance with the requirements of regulatory documents.	12-11 points
"Very good"	The illustrative material (presentation) fully, but with insufficient clarity, reveals the main provisions of the work. The material was created using modern graphic packages, there are minor deviations from the requirements of regulatory documents.	10 points
"Good"	The illustrative material (presentation) fully, but with insufficient clarity, reveals the main provisions of the work. The material was created using modern graphic packages, there are deviations from the requirements of regulatory documents.	9 points
"Satisfactorily"	The illustrative material (presentation) does not fully and clearly reveal the main points of the work. The material was created using modern graphic packages, there are significant deviations from the requirements of regulatory documents.	8 points

[1] *It is taken into account in the total rating along with the grade for the DKR if the student did not score 60 points for the semester or he wants to improve his grade.*

Rating	Evaluation criterion	Points
" Sufficient "	The illustrative material (presentation) does not fully and clearly reveal the main points of the work. The material was not created using modern graphic packages, and there are significant deviations from the requirements of regulatory documents.	7 points
" Unsatisfactory "	Does not meet the "Satisfactory" criterion	0 points

Calculation of points for a report in seminar classes (item 3)

Rating	Evaluation criterion	Points
" Excellent "	The applicant clearly and fully disclosed the goal of the work, the ways to achieve it, and thoroughly substantiated the decisions made. The answers to the questions demonstrate the applicant's ability to professionally defend their own point of view.	4 points
"Very good"	The applicant clearly and fully disclosed the purpose of the work, the ways to achieve it, deeply argues the decisions made, but makes minor errors and assumptions. The answers to the questions are essentially correct, but not always sufficiently complete and reasoned.	3.5 points
"Good"	The applicant clearly and fully disclosed the purpose of the work, the ways to achieve it, deeply argues the decisions made, but makes mistakes and assumptions. The answers to the questions are correct in essence, but not sufficiently complete and reasoned.	3 points
"Satisfactorily"	The report on the work is essentially correct, but it is constructed illogically and unclearly. The answers to the questions are incomplete, and inaccuracies are assumed in the reasoning behind the decisions made.	2 points
" Sufficient "	The report on the work is essentially correct, but it is constructed illogically, unclearly, and has many omissions. The answers to the questions are incomplete, and significant inaccuracies are assumed in the reasoning behind the decisions made.	1 point
" Unsatisfactory "	Does not meet the "Satisfactory" criterion	0 points

Calculation of points for HOME TEST (item 8)

Rating	Evaluation criterion	Points
" Excellent "	At least 95% of the necessary information. The material was created using modern graphic packages in compliance with the requirements of regulatory documents.	25 points
"Very good"	At least 85% of the required information. The material was created using modern graphic packages in compliance with the requirements of regulatory documents.	24-22 points
"Good"	At least 75% of the required information. The material was created using modern graphic packages in compliance with the requirements of regulatory documents.	21-19 points
"Satisfactorily"	At least 65% of the required information. The material was created using modern graphic packages in compliance with the requirements of regulatory documents.	18-16 points
" Sufficient "	At least 60% of the required information. The material was created using modern graphic packages in compliance with the requirements of	15 points

Rating	Evaluation criterion	Points
	regulatory documents.	
" Unsatisfactory "	Does not meet the "Satisfactory" criterion	0 points

Assessment is carried out in accordance with the Regulations on the system of assessment of learning outcomes at Igor Sikorsky Kyiv Polytechnic Institute https://osvita.kpi.ua/node/37

The results are announced to each student individually in the presence of the control event or remotely (by e-mail, in the "Sikorsky" system). They are also recorded in the "Electronic Campus " system.

Violation of task deadlines and incentive points

Incentive points	
Criterion	Weighted score
Participation in scientific and scientific-innovative activities (with the provision of relevant documents)	5 points
Taking distance courses on topics agreed upon with teachers	5 points

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

The applicant receives a positive credit score based on the results of work in the semester if he has a final rating for the semester of at least 60 points and has fulfilled the conditions for admission to semester control, which are determined by the RSO.

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

After completing 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 score for the credit test is lower than the rating, a "hard" RSO is applied – the applicant's previous rating (with the exception of the scores for the semester individual assignment) is canceled and he receives a grade taking into account the results of the credit test. This option forms a responsible attitude of the applicant to making a decision about taking the credit test, forces him to critically assess the level of his preparation and carefully prepare for the test.

***Calendar control** (CC) - is carried out twice a semester as a monitoring of the current status of implementation of syllabus requirements.*

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

Criterion			First Criminal Code	Second Criminal Code
Calendar control period			8th week	Week 14
Conditions for obtaining a positive result from calendar control	Current rating		≥ 10 points	≥ 24 points
	Performing practical work	PR No. 1-6	+	+
		PR No. 7-13	-	+
	Modular test paper No. 1	Estimated MCR	-	+
	Modular test paper No. 2	Estimated MCR	-	-
	Homework test	Estimated HOME TEST	-	-

If academic dishonesty is detected during studies, the test will not be counted.

Semester certification of students

	Mandatory condition for admission to the test	*Criterion*
1	*Current rating*	*RD ≥ 15*
2	*Having a positive assessment for the HOME TEST*	*More than 15 points*

The results are announced to each student individually in person or remotely (by e-mail). They are also recorded in the "Electronic Campus " system.

Optional conditions for admission to the exam:

1. *Activity in practical classes.*
2. *Obtaining a positive assessment for the completed MCR II of more than 10 points*
3. *Writing at least 5 express control papers / test tasks with more than 5 points.*

Table of conversion of rating points to grades on the university scale:

Number of points	*Rating for university scale*
100-95	*Excellent*
94-85	*Very good*
84-75	*Good*
74-65	*Satisfactorily*
64-60	*Sufficient*
Less than 60	*Unsatisfactorily*
Admission conditions not fulfilled	*Not admitted*

9. Additional information on the discipline (educational component)

A list of questions for preparing for the module test, as well as for preparing for the exam, is provided in Appendix 1.

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

The list of courses is offered by the teacher after students express their desire (since the bank of available courses is updated almost every month).

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

The working program of the academic discipline (syllabus):

Compiled

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Associate Professor of the Department of Biomedical Engineering, Candidate of Biomedical Sciences , Kalashnikova Larisa Evgenievna

Approved *by the Department of Biomedical Engineering (Minutes No. 16 dated 06/21/2024)*

Approved *by the Methodological Commission of the Faculty of Biomedical Engineering (minutes No. 9 dated 06/26/2024)*

Appendix 1 to the discipline syllabus

"Introduction to the profession"

List of questions for preparing for the modular test I

1. *Modern biomedical engineering and prospects for its development*
2. *Fundamental and applied sections of BMI.*
3. *Definition and explanation of medical physics*
4. *Definition and explanation of rehabilitation engineering*
5. *Definition and explanation of clinical engineering*
6. *Definition and explanation of bioengineering*
7. *Definition and explanation of biotechnology*
8. *Definition and explanation of nanobiotechnology*
9. *Definition and explanation of genetic engineering*
10. *Tissue Engineering Definition and Explanation*
11. *Definition and explanation of biocybernetics*
12. *Telemedicine Definition and Explanation*
13. *The role and place of an engineer in healthcare*
14. *Bachelor's degree program in Biomedical Engineering*
15. *Define the concept of "science".*
16. *The concept of "information search".*
17. *What types of scientific and educational work do you know of students?*
18. *Stages of information search.*
19. *Sources of information search, their classification.*
20. *Types and characteristics of scientific research.*
21. *What methods of recording what you read do you know?*
22. *Scientific idea, scientific principle. Scientific concepts and hypotheses.*
23. *Bibliographic apparatus of scientific research.*
24. *Explain what scientific research is.*
25. *Electronic means of information retrieval.*
26. *What is the Object and Subject of Research?*
27. *What are the specifics of scientific activity?*
28. *What is an experiment?*
29. *What types of scientific research do you know?*
30. *List the main stages of scientific research.*
31. *Describe your experience finding sources of information.*
32. *Formulate the basic requirements for choosing a topic for scientific research.*
33. *What is a Bibliographic Description?*
34. *What is the relevance of the research?*
35. *What is the purpose of the study?*
36. *What is the research objective?*
37. *Formulate the main requirements for conclusions.*
38. *In which countries is the development of life sciences observed?*
39. *What is the relevance of biomedical engineering for Ukraine?*
40. *What is the sixth technological order characterized by?*
41. *Structure of the Ukrainian economy by technological systems.*
42. *Foresight of the Ukrainian economy.*
43. *Current state of development of innovative technologies in Ukraine.*
44. *Benefits of BMI for the economy of Ukraine.*

45. *Programs for training engineers for healthcare in Ukraine.*
46. *Main areas of research activity of FBMI.*
47. *Main research bases of FBMI.*
48. *Describe a simplified algorithm for an engineering solution.*
49. *The concept of symmetry and proportion.*
50. *The concept of the golden ratio, give examples.*
51. *The concept of golden triangles, give examples.*
52. *The concept of golden rectangles, give examples.*
53. *Fibonacci numbers, basic properties.*
54. *The concept of a logarithmic spiral, give examples.*
55. *The concept of fractal , give examples.*
56. *The main tasks of a biomedical engineer.*
57. *Basic rights and responsibilities of a student.*
58. *Features of the structural and logical scheme of the curriculum for the training of biomedical engineers.*
59. *The main 18 specializations in biomedical engineering*
60. *The main areas of activity of a biomedical engineer.*

List of questions for preparation for the module test II, and also for preparation for the test

1. *Basic principles of scientific epistemology*
2. *Classification and structure of scientific information*
3. *Norms of scientific ethics*
4. *Comparative characteristics of theoretical research methods*
5. *Classification of scientific documents*
6. *Standards of scientific ethics when publishing scientific work*
7. *Identify the features of the methodological principles of scientific research.*
8. *Describe the basic methods of scientific research.*
9. *Biomedical ethics: goals and objectives of biomedical ethics, basic concepts and principles.*
10. *Ethical understanding of genetic engineering problems.*
11. *Types of transplantology. Moral and legal aspects of transplantology*
12. *Principles of biomedical ethics.*
13. *Rules of biomedical ethics.*
14. *Bioethics as a social institution.*
15. *The problem field of biomedical ethics. The connection in the triad bioethics, biomedical ethics, medical ethics*
16. *Doctor and patient: ethical models of interaction.*
17. *The problem of determining the beginning of human life. The moral status of the embryo.*
18. *Ethical and medical problems of abortion.*
19. *Ethical dilemmas of eugenics*
20. *Ethical issues of new reproductive technologies. Artificial insemination.*
21. *Ethical issues of new reproductive technologies. In vitro fertilization*
22. *Ethical issues of new reproductive technologies. Surrogacy*
23. *Biological and clinical death. The problem of "brain death". Developed criteria for death*
24. *The concept of euthanasia. Passive and active euthanasia.*
25. *Moral, legal and organizational aspects of transplantology. Methods of organ harvesting.*
26. *Ethics committees: status, mechanisms for creation, functions and tasks.*
27. *The Three R's Rule. Ethical standards for the use of animals in biomedical research.*
28. *Ethical norms of experiments involving humans. Nuremberg Code.*
29. *Biomedical ethics: emergence and place in the system of natural science, ethics and*

30. *social knowledge*
31. *Modern models of doctor-patient relationships in the mirror of the principles and rules of biomedical ethics*
32. *Causes and conditions of the emergence of biomedical ethics.*
33. *Historical stages of development of biomedical ethics*
34. *Biomedical ethics as a social institution*
35. *Bioethical aspects of the use of animals in biomedicine. Moral code for work with*
36. *laboratory animals.*
37. *Moral problems of implementing the Human Genome Project.*
38. *The Nuremberg Code – an ethical aspect.*
39. *The concept of euthanasia. For and against euthanasia*
40. *Methods of gene technology. Definition and main function*
41. *Ethical issues of free embryos.*
42. *Paternalistic and non-paternalistic models of bioethics*
43. *Describe the bioethics concept of "informed consent"*
44. *Justice in bioethics. Levels of justice. Basic ideas of justice.*
45. *Define "quality of life" according to WHO Scope of application of "quality of life"*
46. *Basic principles of quality of life research*
47. *Describe the aspects of "quality of life"*
48. *The role of the bioethics commission in Ukraine.*