"Biomedical engineering is an interdisciplinary field of science and engineering, which combines engineering and life sciences. The goal of biomedical engineering is to solve problems arising in the study of living objects, with the help of engineering methods and principles."

INFORMATION PACKAGE

FACULTY OF BIOMEDICAL ENGINEERING

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*** *The information is current as for the 2021/2022 academic year. Next academic year, there may be minor changes in the list of training specialties and educational programs.*

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1. COMMON DESCRIPTION OF THE FACULTY

The biomedical engineering industry is growing rapidly and is one of the most promising areas of engineering future. Biomedical Engineering opens new opportunities for career growth and professional development. **Department of Biomedical Engineering (FBME)** - one of the newest faculties of Igor Sikorsky KPI - arose in response to the challenge of the time.

The Faculty trains specialists in the modern sections of Biomedical Engineering, Medical and Biological Informatics and Cybernetics, Physical Rehabilitation. Students are trained at FBMI by about 130 highly qualified teaching staff and leading scientists of the National Academy of Sciences and the National Academy of Medical Sciences of Ukraine, including 2 professors are honored workers of science and technology of Ukraine, 15 doctors of sciences, 20 PhD.

The basic concept of **FBME** is that disciplines combine engineering, information and medical-biological components. In addition to the usual and generally accepted disciplines at the Technical University, students are offered to master Latin and medical terminology, mathematical modeling of physiological systems, telemedicine, medical instrumentation, development of artificial biological objects, biometrics and much more.

FBME students undergoing practical training at the leading research institutions, clinical hospitals and manufacturing plants in Ukraine and abroad. The faculty graduates work both in Ukraine and abroad, thee hold positions of leading specialists - biomedical engineers, software developers, and scientists.

2. STRUCTURE

The faculty consists of five departments; four of them are graduate departments.

- **Department of Biomedical Engineering;**
- **Department of Biomedical Cybernetics;**
- **Department of Human Biosecurity and Health;**
- **Department of Translational Medical Bioengineering;**
- **Department of Health Technologies and Sports.**

3. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students at the **FBME** is carried out at three levels of higher education.

At the first level (Bachelor's course, I–IV academic years) the students acquire fundamental knowledge in biology, medicine, physics, mathematics, mechanics, computer engineering, and special disciplines During the fourth year, they prepare and defend the bachelor's thesis and acquire a bachelor's degree.

At the second level, (Master's course, I-II academic years) students acquire relevant professional skills including laboratory practice. Applicants prepare and defend a master's theses and acquire a master degree

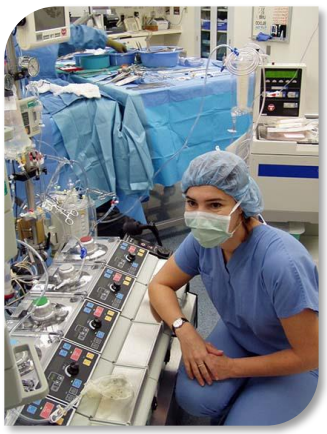
The third educational-scientific level – postgraduate studies, I-IV academic years. Applicants defend their dissertations and they are awarded the educational qualification of Doctor of Philosophy (PhD).

Terms of training: Bachelor – 4 years; Master (education-professional program) – 1.5 years; Master (education-scientific program) – 2 years: PhD – 4 years.

1. Department of Biomedical Engineering trains highly qualified specialists under the following Educational Programs:

Specialty	**Educational Program**	**Levels of higher education**		
		First	**Second**	**Third**
163 Biomedical engineering	Medical engineering	Bachelor *EPP*	Master *EPP*	–
	Biomedical engineering	–	–	PhD *ESP*

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program



Students' training is aimed at obtaining engineering and technical knowledge, skills, and abilities to create tools and methods, improve and research natural and artificial biological objects, machinery, materials, and medical products, technologies, and technical systems for diagnostics, treatment, rehabilitation and prevention of human diseases, as well as software and information technologies for solving applied and fundamental problems of biology and medicine.

2. Department of Biomedical Cybernetics trains specialists under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
122 Computer science	Computer technologies in biology and medicine	Bachelor *EPP*	Master *EPP*	–
			Master *ESP*	
	Computer science	–	–	PhD *ESP*

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

The Department trains specialists competent in design, development, and practical application of medical information systems; medical robotics and nanotechnology; medical systems for diagnostics and monitoring the state of the body; medical cybernetics and simulation; telemedicine.

Specialists of the department share the experience of developing advanced computer technologies and systems in the priority areas of artificial intelligence, automated medical decision-making systems. The department has developed new effective architectures of neural networks and technologies for the selection of disease markers, which have been introduced to diagnose and predict the course of Covid-19, differentiate chemoresistant and sensitive forms of tuberculosis, automatically determine the presence and degree of liver fibrosis, diagnose coronary heart disease. The research results are protected by patent law, publications in domestic and foreign publications with indexation in prestigious scientometric databases Scopus and Web of Science, implemented in research institutes of NAMS of Ukraine: SI "Institute of Nuclear Medicine and Radiation Diagnostics", F.G. Yanovsky National Institute of Phthisiology and Pneumonology, M.M. Amosov National Institute of Cardiovascular Surgery. Graduates of the department work in the most prestigious branches and representative offices of foreign companies - developers of software and medical equipment (EPAM, Materialize, Samsung, etc.).

3. Department of Human Biosecurity and Health trains specialists under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
227 Physical Therapy, Ergotherapy	Physical Therapy	–	Master *EPP*	–
	Physical Therapy, Ergotherapy	Bachelor *EPP*	–	PhD *ESP*

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

Training is provided at the junction of such areas as biomedical engineering, instrumentation, and computer science.

Student training is based on the application of bioengineering, instrumentation, biomechanics, robotics, biomaterials, as well as tissue, cell engineering, and nanotechnology for the implementation of reconstructive technologies, study, development, and improvement of means and methods of maintenance and restoration of organs and functions. development and operation of technical means of physical rehabilitation.

Students study traditional manual technologies, as well as master modern computerized medical and diagnostic systems.

4. Department of Translational Medical Bioengineering prepares specialists under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
163 Biomedical Engineering	Regenerative and Biopharmaceutical Engineering	Bachelor *EPP*	Master *EPP*	–
	Biomedical engineering	–	–	PhD *ESP*

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

Department of Translational Medical Bioengineering was created in 2018. The direction of the department is the engineering and technological foundations of translational medicine - a modern field, which ensures the rapid introduction (translation) of fundamental discoveries in the field of natural sciences into the practice of health care.

Regenerative medicine aims at repairing diseased or damaged (injured) tissue using cell therapy methods.

Biopharmaceutical engineering is an interdisciplinary scientific and technical field, aimed at the development and production of therapeutic, prophylactic, and diagnostic products (preparations) of biological origin (vaccines, blood, and its components, allergens, gene therapeutic constructs, tissues, recombinant proteins, living clinical cells).

The educational process and scientific development are provided by highly qualified staff, including 6 persons of the teaching staff (one professor, three associate professors, a senior teacher, and an assistant).

The educational program contains a wide range of disciplines that necessary for the development and implementation of modern biomedical technologies and form the following competencies for students:

- Understanding of biological processes, ability to analyze and control them.
- Understanding, ability to organize and manage technological processes with the participation of biological objects (technological disciplines).
- Ability to create and choose engineering and hardware design of technologies, including using software (engineering disciplines).
- Ability to create and implement technological and engineering solutions, taking into account the legal requirements for the quality, safety, and efficiency of bioproducts and technologies, as well as the rules of bioethics and biosafety (regulatory and policy disciplines).

5. The Department of Health and Sports Technologies is a university-wide one. Its activities are carried out under the laws of Ukraine "On Higher Education", "On Physical Culture and Sports" and other legislative acts of the state.

The object of activity is first and second-year students of the Igor Sikorsky KPI full-time and part-time education.

Particular attention is paid to the formation of the competence of a healthy lifestyle and health culture, professional and applied physical training, and

strengthening the health of students through physical culture and sports.

The purpose of the department is the scientific search, development, and improvement of educational and methodological approaches to the formation of health culture and level of physical fitness of applicants for higher education by introducing technologies for healthy living, health management, improving methods of physical and psychological preparation of young people for active life and professional activity.

The department teaches the normative discipline "Fundamentals of a healthy lifestyle" and several optional practical disciplines in physical education: "Martial Arts", "Games", "Strength", "Difficult coordination", "Cyclic". Their content is based on the principles of prognostic pedagogy and takes into account the age characteristics of students, which is closely linked with the other disciplines that shape the culture of personal health in the process of higher education.

4. TRAINING AND LABORATORY BASE

The faculty is equipped with modern **laboratory facilities**:

- Scientific and technological laboratory for the development of medical devices and systems. The main tasks of the laboratory are the development of software and hardware, medical devices, technology software development, development and adaptation of software, conducting research, providing conditions for mastering practical skills.
- Lab of Web-design and Web-technologies. Its basic functions are providing the opportunity for students to master their skills on the practical application of acquired knowledge on the subject "WEB technologies and WEB-design", conducting scientific research in computer science, biomedical engineering and life sciences, development of information systems and web applications.
- Interdepartmental laboratory of functional reserves of the human body. Laboratory activities are aimed at practical mastering of knowledge and skills on the determination of physiological parameters of the person, health check student computer programs for determining physiological parameters of a person, conducting the study, and physiotherapeutic devices and methods.
- Laboratory of medical microprocessor systems, where training stands allow exploring the development of medical devices and systems based on digital signal processors and tools of the modeling signal.
- Educational scientific medical engineering laboratory.

Students of the **Department of Biomedical Engineering** can also gain work experience and follow refresher courses at the Amosov National Institute of Cardiovascular Surgery and modern clinical laboratories of other institutes and centers of the Ministry of Health and NAMS of Ukraine. They include Institute of Molecular Biology and Genetics, National Academy of Sciences of Ukraine, Frantsevich Institute of Problems of Materials of NAS of Ukraine, Research and Training Centre of Cardiovascular Engineering Igor Sikorsky KPI, modern laboratories and production facilities.

To provide comprehensive investigations, a Laboratory of Functional Diagnostics operates at the **Department of Health and Sports Technologies**, which hosts the massive examination of teachers and students. The laboratory has developed a means of individual monitoring to assess the dynamics of health status and the width of the regulatory range.

5. RESEARCH ACTIVITY

The main researching areas of the Faculty:

1. Biomedical Engineering
2. Biomedical Informatics
3. Life Science
4. Sport Science
5. Rehabilitation Engineering
6. Regenerative Bioengineering
7. Biosafety and Biosecurity Engineering
8. Development and testing of preparations (products) of biotechnological origin with immunomodulatory, regenerative, and nutraceutical properties, as well as the organization of their production.
9. Development, bioanalytical and technological standardization of medical devices for serological diagnostics of infectious and non-communicable diseases.

6. INTERNATIONAL PROJECTS AND COLLABORATION

Faculty of Biomedical Engineering actively develops research partnerships, participates in research projects, and performs research themes financed from the state budget of Ukraine, by the order of enterprises and organizations of Ukraine, as well as companies of other countries.

- Implementation of projects financed from the state budget of Ukraine.
- Implementation of projects in the framework of the Ukrainian-Lithuanian cooperation Program in the field of science, education, and culture.
- **FBME** is involved in the project of the 7th Framework Program of the European Union ("People").
- **FBME** participates in projects of the Erasmus+ program, funded by the European Union.
- Participation in the implementation of the joint project with the "Samsung electronics Ukraine company".
- **FBME** actively cooperates with the office of the company Materialise, the office of National Instruments, and others.

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