"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

Kyiv, 2022

CONTENTS

*** *The information is current as for the 2022/2023 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 who are honored workers of science and technology of Ukraine, 15 doctors of sciences, 20 Ph.D.

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 undergo 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, and they hold positions of leading specialists - biomedical engineers, software developers, and scientists.

2. STRUCTURE

The faculty consists of five departments; four of them are graduating departments:

1. **Department of Biomedical Engineering;**
2. **Department of Biomedical Cybernetics;**
3. **Department of Biosafety and Human Health;**
4. **Department of Translational Medical Bioengineering;**

- **Department of Rehabilitation Technology and Sports (non-graduating).**

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's 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 (Ph.D.).

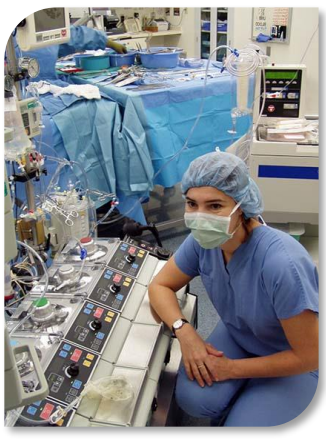
Terms of training: Bachelor – 4 years; Master (education-professional program) – 1.5 years; Master (education-scientific program) – 2 years: Ph.D. – 4 years.

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	–	–	Ph.D. *ESP*

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

Training of students 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.



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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*	–
	Computer Science	–	Master *ESP*	PhD *ESP*

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

The Department trains specialists competent in the 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 and 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, and 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 Biosafety and Human 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

The department trains specialists in the field of Health Care in the specialty 227 Physical Therapy, Ergotherapy. This relatively new specialty was formed based on such specialties and specializations as physical rehabilitation, rehabilitation medicine, physical therapy, sports medicine, balneology. Given the different systems of training in these areas, one of the main tasks facing specialists is to form a unified approach to the educational space in the specialty.

Students study rehabilitation technologies in the fields of neurology, cardiology, pulmonology, gerontology, injuries and diseases of the musculoskeletal system, and other relevant nosologies: cerebral palsy, post-stroke conditions, combat trauma, and more. Students study traditional manual and modern kinesiotherapy technologies.

Special attention in the training is paid to rehabilitation technologies with the use of modern medical-diagnostic complexes and systems, including robotic, computerized, and wireless rehabilitation complexes. Particular attention is paid to biosafety and biosecurity.

An important element of the educational process is learning through research. Student training involves the development and improvement of physical therapy technologies.

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

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
091 Biology	Applied Biology	–	–	Ph.D. *ESP*
163 Biomedical Engineering	Regenerative and Biopharmaceutical Engineering	Bachelor *EPP*	Master *EPP*	–
	Biomedical Engineering	–	–	Ph.D. *ESP*

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

The 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).

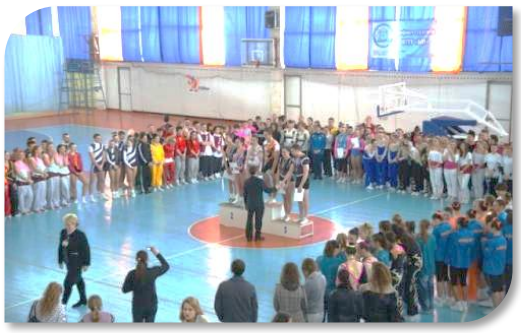
The educational process and scientific development are provided by highly qualified staff, including 6 persons of the teaching staff (one professor, three associate professors, a senior teacher, and an assistant).

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

- Understanding of biological processes, the ability to analyze and control them.
- Understanding of the 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. Department of Rehabilitation Technology and Sports is a university-wide department, whose teachers conduct theoretical and practical classes in the discipline "Basics of Healthy Lifestyle", different types of motor activity and sports (selective disciplines), and also conducts practical classes and lectures on physical education with the first and second years of study students of all institutes and faculties of the Igor Sikorsky KPI (about 700 academic groups).



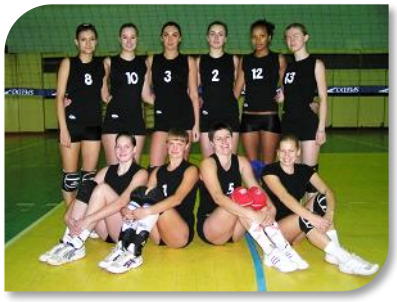
Among the teachers are masters of sports, masters of sports of international class, and PhDs.

The department has a system of responsible persons for sports and health work at the faculties. Apart from organizing and carrying out sports and health-improving work at the faculties, the responsible persons also solve problems arising in the process of controlling activities in the discipline "Basics of Healthy Lifestyle" and selective disciplines.

The department includes:

- Sports and Technical Center "Kyiv Polytechnic" of the Center of Physical Education and Sports (CFES):
- Sports Club "Atlantis" - diving (CFVS pool and open bodies of water, sea coast).
- Sports club "Talisman" - aerobics (CFVS);
- Sports club "Rugby Polytechnic" - rugby (CFVS);
- Sport club Globus - hiking (on the selected terrain);
- Sports club "Typhoon" - martial arts (CFVS);
- Sports club "Acro-line" - acrobatic yoga (CFVS);
- Sports club "Polytechnic" - soccer and futsal (CFVS).

The teachers of the department train national teams in the following sports (sports orientation, tourism, and rock climbing, ping-pong, futsal, track and field athletics, triathlon, sports aerobics, rugby).



Sectional training sessions are held in soccer, mini-football, basketball, volleyball, sports aerobics and fitness, athletics, orienteering, swimming, wrestling, boxing and kickboxing, weightlifting, arm wrestling, shooting, and water polo.

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, and 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 in 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, and 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 the 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.

5. RESEARCH ACTIVITY

The main research 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.

Partner universities:

- University of Klaipeda (Lithuania);
- Kaunas Technical University (Lithuania);
- University of Dresden (Germany);
- Warsaw University of Technology (Poland);

- Technical University of Prague (Czech Republic);
- Drexel University (USA);
- Institute of Hygiene (Vilnius, Lithuania).

The National Technical University of Ukraine " Igor Sikorsky Kyiv Polytechnic Institute" is an institutional member of the EPMA (EUROPEAN ASSOCIATION FOR PREDICTIVE, PREVENTIVE & PERSONALIZED MEDICINE) (Brussels, Belgium).

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