

«...Biotechnology is the science of obtaining required for people materials and products with the use of living organisms, and with the use of special equipment – bioengineering...»



INFORMATION PACKAGE

FACULTY OF BIOTECHNOLOGY AND BIOENGINEERING

Kyiv, 2016

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*** *The information is current as for 2016/2017 academic year. In the next academic year, there may be minor changes in the list of training directions, specialties, and specializations.*



**Foreign Economic Activity
Office**
+38044 2366281
forea@kpi.ua
[/forea.kpi.ua/](http://forea.kpi.ua/)

Faculty of Biotechnology and
Bioengineering

+380 44 204 9452
+380 44 204 8312
biotech@ntu-kpi.ua
biotech.kpi.ua



1. COMMON DESCRIPTION AND THE STRUCTURE OF FACULTY

The first in Ukraine **Faculty of Biotechnology and Bioengineering (FBB)** was created in January 2001 in the Igor Sikorsky KPI on the base of the Department of Biotechnology of the Faculty of Chemical Technology.



Biotechnology is the science of obtaining required for people materials and products with the use of living organisms, and with the use of special equipment - bioengineering.

The Faculty provides training of highly qualified personnel to work in the most modern sectors of biotechnology: microbial synthesis of biologically active compounds, immune- biotechnology, genetic engineering biotechnology, biotechnology of pharmaceutical drugs, eco biotechnology, bioenergetics, biodegradation of wastes, obtaining a useful substance from the biomass and wastes, biotesting of pollutions, engineering support of biotechnological and pharmaceutical productions, molecular biotechnology and bioinformatics.

Graduates of the Faculty are capable to develop and implement the latest technological processes and to design equipment for biotechnological and pharmaceutical productions, monitor and protect the environment of man-made impacts competently and scientifically , simulate biotechnological processes in order to determine the optimum conditions of biosynthesis, biodestruction of wastes and optimization of damaged ecosystems through widespread use of the most advanced mathematical methods and computer technology.

Structure

Today, the Faculty of Biotechnology and Bioengineering consists of 4 departments and 3 research laboratories:

- Laboratory of Physical and Information Technologies in Biology and Medicine;
- Laboratory of Magnetic Nanotechnology in Medicine and Biology;
- Laboratory of Vacuum Technology in Biology and Medicine.



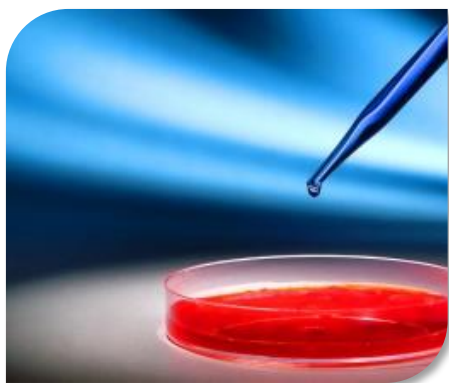
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1. Department of Industrial Biotechnology trains professionals with a degree in "Biotechnology and Bioengineering" (specialization "Industrial Biotechnology").



The department provides scientific and engineering personnel for the biotechnological, biochemical and chemical industries, food industries, research and design institutions of the biological and chemical profile, sanitary inspections, firms and institutions that produce food additives and veterinary drugs, control and production laboratories, control and analysis laboratories, certification centers.

Future specialists-biotechnologists actually are getting three educations: chemical, engineering, and biological. In addition to general scientific and engineering disciplines, students study such disciplines as microbiology and virology, biochemistry, genetics, cell and genetic engineering, immunology, general biotechnology, fundamentals of pharmaceutical production. Graduates of the department are working at the leading pharmaceutical and biotech companies of Ukraine, certification laboratories and biocontrol. They are developing biologically active drugs at the Institute of Microbiology and Virology, Molecular Biology and Genetics, Biochemistry and others.

2. Department of Bioengineering and Engineering trains professionals with a degree in "Industrial Engineering" (specialization "Equipping of Pharmaceutical and Biotechnological Industries").

The department trains professionals who are well oriented in the foreign and domestic equipment of pharmaceutical and microbiological industries, and due to it:

- perform engineering for the implementation of the equipment at domestic plants and factories with the subsequent support and maintenance;
- design new equipment for pharmaceutical and microbiological industries for the production of the domestic machine-building plants.



Graduates of the department are successfully working at the leading enterprises of Kyiv: PJSC "Darnitsa", JSC "Farmak", "Rosinka", PJSC "Byofarma", "Kyiv Winery of Sparkling Wines", PJSC SIC "Borshchahivskiy CPP."



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3. Department of Bioinformatics

trains professionals with a degree in "Biotechnology and Bioengineering" (specialization "Molecular Biotechnology").



The department has two research laboratories:

- Laboratory of Physical and Information Technologies in Biology and Medicine;
- Laboratory of Magnetic Nanotechnology in Medicine and Biology;
- Laboratory of Vacuum Technology in Biology and Medicine.

The department is provided with modern equipment such as probe scanning microscope NanoEducator, centrifuge apparatus, chamber for horizontal electrophoresis, apparatus for determining the magnetic susceptibility of magnetically sorbents and magnetic pharmaceutical forms, apparatus for producing of high-gradient ferromagnetic attachments by electrodeposition in magnetic field and by magnetically controlled corrosion, photocolimeters KFK-2, thermostat, pH-meter, sterilizer, potentiostat, biological microscopes. All equipment is used for carrying out the educational process and in the performance of research works of students and graduate students, as well as for scientific research of the department.

Bioinformatics makes it possible to simulate biotechnological processes at the stages of development of industrial technologies, to analyze and predict the properties of new biological structures and molecules.

Graduates of the department can work on the biochemical and biotechnological production of pharmaceutical chemicals companies, in the food industry, in the research and design institutions of biological, medical, and chemical directions, diagnostic laboratories, research centers for the creation of new drugs.

4. Department of Ecobiotechnology and Bioenergetics

trains professionals with a degree in "Biotechnology and Bioengineering", specialization: "Ecological Biotechnology and Bioenergetics".

In addition to the basic disciplines of biological, chemical and engineering areas students study modern technologies of waste processing of different origin and specially grown biomass into the energy and useful substances that can replace existing synthetic analogs obtained with the use of natural gas and oil. Students study the new wastewater treatment technology, the design of treatment plants and bioreactors. At the Department, the genetic engineering techniques are used for the obtaining of bacteria, plants and other



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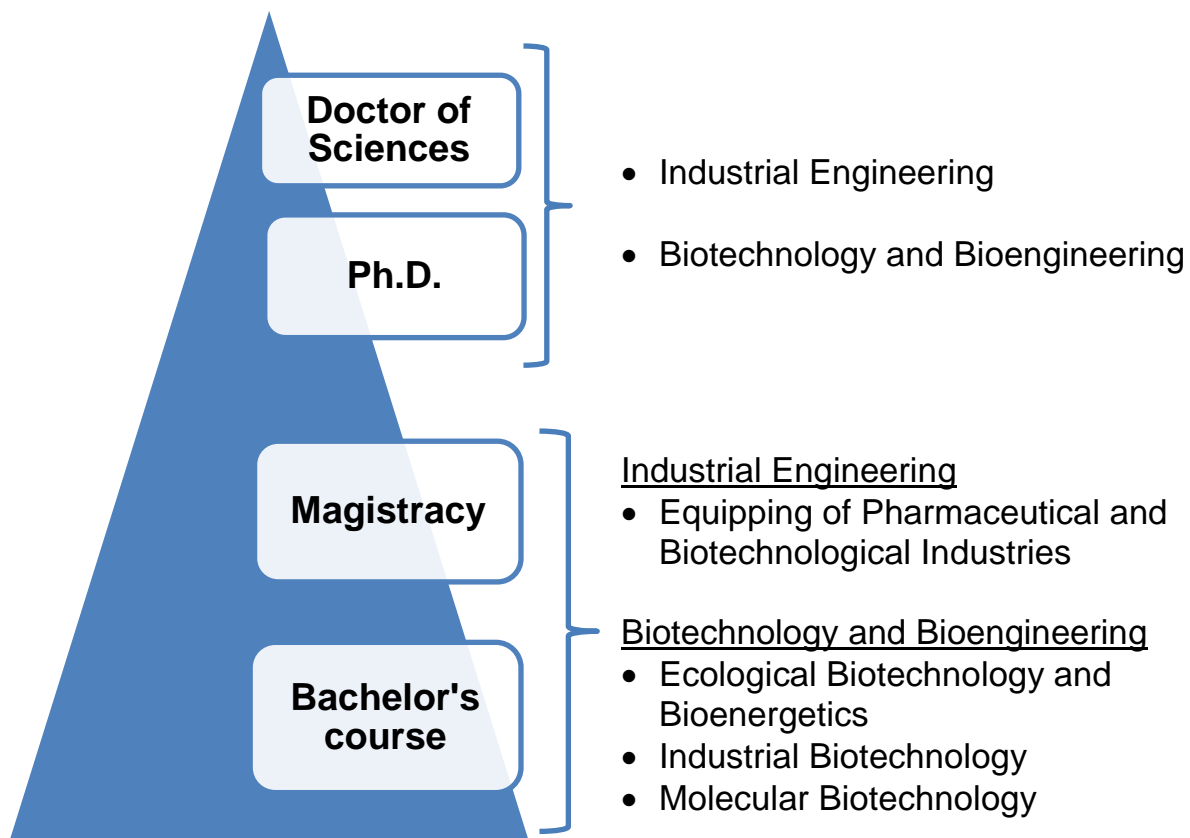
organisms with desired properties for use in environmental biotechnology to increase the energy output.

2. EDUCATIONAL PROGRAMS

Terms of specialists training: Bachelor (b) - 4 years; Master (m) - 2 years.

After receiving of basic higher education (Bachelor - 4 years), graduates are enrolled on a competitive basis to study at the master's program (2 years) to get a complete higher education. The best graduates can continue their education in the Ph.D. program.

Specialties and specializations of students' training:



Graduates of the faculty are working in managerial and engineering positions at the enterprises of microbiology, pharmaceutical, food industry, design organizations, institutions of environmental protection and research institutes in Ukraine and abroad.



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3. TRAINING AND LABORATORY BASE

The academic staff of the faculty actively use modern teaching technology during lectures, practical training, seminars and laboratory sessions. They apply modern software products, Internet-resources, modern means of presentation, visual support of lectures in the form of films, videos, slides, etc.

4. RESEARCH ACTIVITY

Department of Industrial Biotechnology

The main directions of scientific work of the department:

- Biotechnology of microbial synthesis of vitamins.
- Genetic activity of nanocomposites and chemical contamination of agricultural and food products, cosmetics and household chemicals.
- The use of biotechnology and biotechnology in medicine.
- Biochemistry and biotechnology of higher basidiomycetes.
- Development of technology for probiotic preparations based on lactate bacteria.
- Biotechnology and finished pharma products of bacteriolytic enzymes and antibiotics.
- Development of tools *in-vitro*-diagnostics of infectious diseases and hormonal disorders.
- Biotechnology of fungal carotenoids. Enzyme systems of the genus *Polyporus*.
- Biotechnology of polysaccharides obtaining from higher basidiomycetes.

Department of Bioengineering and Engineering

The main directions of scientific work of the department:

- Development of membrane systems for private households.
- The vibration of flat and shell fragments under the influence of the kinematic and wave spatial factors.
- Terms of occurrence of the wave coincidence and spatial-frequency resonances.
- Implementation of acoustically transparent structures.
- Remote control of heat transfer process in a bioreactor with an ultrasonic beam.
- Membrane technologies of mixtures treatment.
- Mathematical modeling techniques in biotechnology.



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Department of Ecobiotechnology and Bioenergetics

The main directions of scientific work of the department:

- Modern technology of biological wastewater treatment.
- Development of microbial fuel cells to produce electricity and hydrogen.
- Biotechnology producing of energy carriers (methane, hydrogen, alcohols, etc.) from the organic wastes of different origin.
- Studies of the impact of physical and chemical factors on the change in microalgae metabolism to produce energy carriers, biologically active substances, drugs.

Department of Bioinformatics

The main directions of scientific work of the department:

- Scientists of the Department of Bioinformatics with the use of comparative genomics methods discovered not only an exclusive genetic mechanism of biomineralization of biogenic magnetic nanoparticles for all organisms, but also for the first time it was detected in carcinoma of Ehrlich in collaboration with the RE Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology, National Academy of Sciences of Ukraine, Kyiv.

In cooperation with the State scientific institution "Scientific-Practical Center of Preventive and Clinical Medicine" of the State Administrative Department scientists of the Department for the first time experimentally discovered biogenic magnetic nanoparticles in atherosclerotic plaques. The development of new magnetic form for targeted drug delivery to the tumor together with the RE Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology.

- The study of self-organization processes in the system metal-electrolyte in a constant magnetic field.
- Magnetically controlled biosorption of heavy metal ions by *S.cerevisiae* yeasts in a constant field with the use of the system of ferromagnetic elements.
- Microstructuring of metal surfaces by electrodeposition and controlled corrosion in the magnetic field.
- Development of high gradient magnetic matrix and designs of magnetic separators.
- Development of new methods for producing magnetically controlled sorbents, including biosorbents for biomedical purposes.



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5. INTERNATIONAL PROJECTS AND COLLABORATION

The international inter-university cooperation includes joint scientific and educational projects, an organization of short-term exchange programs for student, graduate students and teachers, and collaborative research.

Department of Bioinformatics participates in the grant under the program of EU Horizon 2020, Marie Skłodowska-Curie Research and Innovation Staff Exchange (RISE) project " MagIC - Magnonics, Interactions, and Complexity: multifunctional aspects of spin wave dynamics ", № 644 348, **total 756'000 euro** for 4 years.

In the framework of the grant, the Department carries out scientific works with Adam Mickiewicz University in Poznań (Poland), University of Exeter (United Kingdom) and the University of the Basque Country (Spain). Business trips to fulfill joint research project on the subject of the Department, participation in international conferences, holding international scientific seminars and internships are provided.



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6. CONTACT INFORMATION

1. Faculty Dean: Prof., Dr. of Biology, Dugan A. M.

Address: 37 Prospect Peremohy, Ed. Building 4, Room 169, Kyiv, Ukraine

Phones: +38(044) 204-94-52, +38(044) 204-83-12

e-mail: biotech@ntu-kpi.kiev.ua

Official website: biotech.kpi.ua

2. Department of Bioengineering and Engineering

Head of Department: Prof., Dr. of Technics, Melnik V. N.

Phone: +38(044) 204-81-83

Official website: bioengineering.kpi.ua

3. Department of Bioinformatics

Head of Department: Prof., Dr. of Technics, Gorobets S. V.

Phones: +38(044) 204-99-37; 204-80-54;

Official website: bioinform.kpi.ua

4. Department of Ecobiotechnology and Bioenergetics

Head of Department: Prof., Dr. of Chemistry, Kuzminski E. V.

Phone: +38(044) 204-97-79

Official website: keb.kpi.ua/

5. Department of Industrial Biotechnology

Head of Department: Associated Prof., Ph.D. of Technics, Todosiichuk T. S.

Phones: +38(044) 204-98-51, 204-82-13

Official website: prombiotech.kpi.ua/



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