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INFORMATION PACKAGE

INSTITUTE OF MECHANICAL ENGINEERING

Kyiv, 2020

CONTENT

****** Information is current as for the 2020/2021 academic year. In the next academic year, there may be minor changes in the list of training specialties and educational programs/specializations.***

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1. COMMON DESCRIPTION AND THE STRUCTURE

Institute of Mechanical Engineering (IME) is one of the largest scientific and educational divisions of the Igor Sikorsky KPI. IME provides high-quality training of engineers since 1898. Today, high-level training is provided by the qualified staff of professors and teachers, modern material and technical base of the departments, use of computer-aided design systems. Institute consists of 8 specialized departments, a branch research laboratory, two teaching and research laboratories, the certification body of engineering products and quality systems, research and test center "Reliability"

Studying at the **IME**, one can simultaneously obtain an additional degree in finance and economics or jurisprudence at the Igor Sikorsky KPI. The institute has three specialized councils for certification of doctoral theses.

IME allows graduates to have internship and find jobs in leading Ukrainian and foreign companies such as SE Antonov, Hydrosila Group, Nibulon, Boeing, HAAS (USA), Airbus (France), Delcam (United Kingdom), Festo (Austria), Heidenhain, Rexroth Bosch Group (Germany) and others.

Structure

The Mechanical Engineering Institute consists of 5 graduating departments, the Joint Training and Research Center "KPI – PROGRESTECH-Ukraine – Boeing-Ukraine", as well as two training and research laboratories, a body for certification of metal and woodworking equipment and engineering products and quality systems. , research and testing center "Reliability".

On February 4, 2016 in Institute of Mechanical Engineering was opened a new Joint Educational and Scientific Center of the Igor Sikorsky KPI and companies "Boeing" and "Progresstech-Ukraine"

The educational program "Dynamics and strength of machines" received international accreditation and is recognized as corresponding to requirements of the European programs of engineering education.

1. Department of Dynamics, Strength of Machines and Resistance of Materials provides training of specialists with a degree in "Applied Mechanics" (specialization "Dynamics and Strength of Machines") in the field of computer and experimental solving of actual applied problems of strength in biomechanics, aviation, motor vehicle industry, shipbuilding, energetics, rocket production, and astronautics.

Faculty graduates get in-depth knowledge of mathematics, physics, the theory of elasticity, ductility, mechanical vibrations, numerical calculation methods for strength, durability, and reliability of materials and components with the use of PC. Students acquire skills to work with the unique equipment, use of modern systems of computer mathematics (Mathcad, Matlab, Maple) and graphics (KOMPAS 3D, Solidworks, AutoCAD), computer-aided design of machines and calculations in engineering, computer software engineering projects (CAD/CAM/CAE systems) (Autodesk Inventor, FEMAP, ANSYS, MSC.ABACUS, CATIA, etc.) and macroeconomics.

To reflect contemporary issues facing the machine-building enterprises, new specialization Project Management of Mechanical Engineering was set up at the Department, which provides in-depth training in economics.

2. Department of Aircraft Production Technology trains specialists in the specialty "Applied Mechanics" (educational programs/specializations "Aircraft Production Technologies" and "Applied Mechanics of Plasticity of Materials").

Specialists receive fundamental engineering training in complex technologies of science-intensive machine-building production; design of forging and pressing machines and equipment for the manufacture of construction materials. Knowledge of information technology, international system of quality of mechanical engineering products, organization of production, basics of management and marketing provide specialists with a stable demand for enterprises of various forms of ownership.

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3. Department of Applied Hydroaeromechanics and Mechanotronics trains high-quality specialists with a degree in "Applied Mechanics" (specialization "Automated and Robotic Mechanical Systems") for all branches of engineering (mechanical engineering, aviation, oil, and gas industry, industrial automation, motor-vehicle industry, medicine).

Department graduates are engaged in the development of pneumatic and hydraulic devices used in automatic control machine tool systems, rolling mills, presses, turbine control systems, and internal combustion engines, aircraft and spacecraft, shipbuilding and transport equipment, road construction, agricultural and special equipment.

The laboratories of the department are equipped with the latest equipment from leading companies: Bosch-Rexroth, Festo, HAWE, Hydrosila GROUP, and others.
"Igor Sikorsky KPI – FESTO" Center and the Rexroth branch take part in the training.
The best students undergo an internship in Germany.

Targeted training and job placement of specialists is carried out at the department ("IRCOM", "Geofizpribor", ASTC "Antonov", representative offices of companies SMC, HYDAC, FESTO, Carnozzi, Karcher, Rexroth).

4. Department of Technology of Machine Building trains high-quality specialists with a degree in "Applied Mechanics" (specialization "Technology of Machine Building").

Specialization mastered by students offers modern methods of production of mechanical engineering products with extensive use of CNC machine tools, flexible manufacturing systems, industrial robots, computer-aided design and manufacturing systems, modern methods and means of quality control; practical skills of the production and HR management, knowledge of the laws of the market economy, marketing and management.

The specialization provides in-depth computer training in the field of PLM-technologies, which greatly enhances employment opportunities. According to individual plans, professionals are trained who are working successfully in the fields of the aerospace industry, manufacturing with the use of high-precision technology, machine tool building, instrument making, motor vehicle industry, aircraft industry, and electronics.

Educational and Training Center "Igor Sikorsky KPI - HAAS", which is equipped with the modern CNC processing centers from the world-famed company HAAS (USA) operates at the department.

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5. Department of Machine Design trains high-quality specialists with a degree in "Applied Mechanics" (specialization "Technology of Computer Design of Machines and Robots")

The specialization provides training of design engineers in the field of mechanical engineering and metalworking. Graduates receive advanced training in fundamental engineering construction and machinery manufacturing technology, industrial robots and other machines; the use of modern methods of searching for technical solutions, methods of theoretical and experimental research of machines; programming on PC, mathematical modeling, the fundamentals of patent and licensing work, technical service and repair of machinery and control systems; organization of production, the economics, the fundamentals of management and marketing.

Training Center with the programmer's working places was organized based on digital program control from company Heidenhain (Germany).

Specialization "Intellectual Property in Engineering" provides comprehensive training in international patent and licensing activity, international law in the field of intellectual property, the acquisition of intellectual property rights, management of intellectual property rights and their protection.

Scientifically-Methodical Laboratory of Virtual Ways of Training in Engineering Mechanics

The Laboratory was founded in 2001 as a sub-division of the Institute of Mechanical Engineering with the purpose of development and implementation in the learning process applied software for practical and laboratory work on the modeling of real processes of metalworking software products for the Engineering Mechanics.

Research and Testing Center "Reliability" consists of 7 laboratories, which operate under the guidance of of leading scientists and specialists of the institute

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2. EDUCATIONAL PROGRAMS

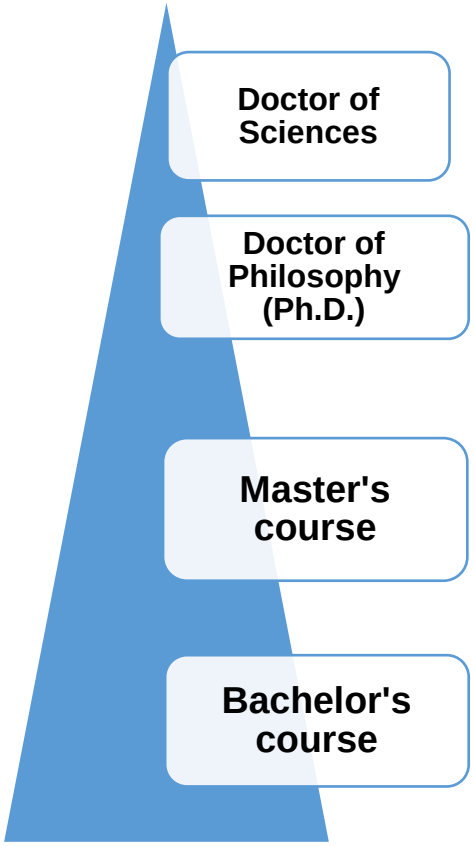
Levels of higher education. Training of students at the IME is carried out at several levels of higher education. The first (Bachelor's course, I – IV academic years) – the students acquire fundamental knowledge of physics, mathematics, mechanics, computer engineering, and special disciplines. During the fourth year, they 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 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, 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; Doctorate – 2 years.

Specialties and educational programs/specializations:



Applied Mechanics

Applied Mechanics

- Dynamics and Strength of Machines
- Technology of Machine Building
- Applied Mechanics of the Material Plasticity
- Aircraft Production Technologies
- Technology of Computer Design of Machines and Robots
- Instrumental Systems of Technical Design
- Automated and Robotic Mechanical Systems

3. TRAINING AND LABORATORY BASE

The training-laboratory base of **IME** consists of:

- Educational and scientific Laboratories of Computer Engineering;
- Laboratory of Measurement Technology;
- Laboratory of Durability and Reliability;
- Laboratory of Polymer and Composite Materials'
- Training and Research Laboratory of Mathematical Modeling Methods in Mechanics of Solid Deformable Body;
- Science and testing Center "Reliability";
- Training Center "Igor Sikorsky KPI - HAAS";
- Research Center of Special Technology;
- Training and Scientific Center "Igor Sikorsky KPI –FESTO";
- Joint Training Center "Igor Sikorsky KPI - Progresstech-Ukraine";
- Joint Center of CAD/CAM technologies Igor Sikorsky KPI- Delcam, United Kingdom.

The best senior students have the opportunity to get "FESTO-didactics" firm scholarship and undergo monthly training at the enterprises of the company in Austria

In the Educational and Training Center, "Igor Sikorsky KPI – HAAS" students are trained to use the advanced technology of machine-building production: beginning from the computer development of control programs for CNC machines with the help of modern integrated CAD/CAM systems and finishing by the production of parts with the use of lathe and milling centers of HAAS company (USA). Manufacturers are trained and retrained in the Center too. Center for postgraduate education was created at the faculty.

To improve the level of specialists' training, Training Center "Igor Sikorsky KPI - FESTO" was established at the ***Department of Applied Hydroaeromechanics and Mechatronics*** jointly with the Austro-German company FESTO. The Center is equipped with the most advanced technique and training stands. Students can get acquainted with the modern methods of production and testing of systems and components of hydro automatic, CAD methods.

The Joint Training Center "Igor Sikorsky KPI - Progresstech-Ukraine"; which was opened based on the Mechanical-Engineering Institute, provides training of mechanical engineers for work in the aviation industry and advanced training of specialists working in the aviation industry.

4. RESEARCH ACTIVITY

The main directions of scientific research of ***Department of Dynamics, Strength of Machines and Resistance of Materials***:

- development of models and failure criteria of structural elements under complex thermal-loads because of damages;
- development of equations of the theory of plasticity and creeping under complex loading processes;
- development of the theory of nonlinear oscillations;
- development of numerical methods for solving boundary value problems of the mechanics of deformable bodies;
- development of mathematical models of the plasticity of anisotropic media under complex stress state;
- development of methods of calculation of the bearing capacity of structural elements of the composite and polymer materials.

Department of Aircraft Production Technology performs research and development in the following areas:

- creation of information technology for the implementation of intensive plastic deformation of materials in the cold and the determination of optimal process parameters;
- improvement of existing and development of new low-waste and waste-free high-performance manufacturing processes of cold forming of precision products made of ductile and low-ductile metal;
- computer-aided design stamping tooling for various operations of cold forging.

Department of Applied Hydroaeromechanics and Mechanotronics performs research and development in the following areas:

- fluid dynamics and heat transfer in non-Newtonian fluids and the processes of their treating;
- creation of computer-aided design systems of electrohydraulic, pneumatic, electromagnetic drives of aircraft, industrial robots, road construction, agricultural and other machines;
- the creation of new structures of volume hydraulic and pneumatic drives and hydropneumatic machinery control systems;

- development of regulatory and hydropneumatic overlapping bodies with improved characteristics;
- creation of a complex piezohydropneumatic automation equipment;
- simulation modeling of hydropneumatic tools and systems;
- research of fluid and gas dynamic processes in energy converting machinery and aggregates.

Department of Technology of Machine Building carries out scientific research in the following areas:

- control of cutting processes on the CNC machines;
- optimization of machining processes;
- automation of control programs for CNC machine tools;
- creating macro routines for CAD/CAM systems;
- methods of complex surfaces processing of machine parts;
- automation of machine assembly in mechanical engineering and instrument making;
- technology and software for the investigation of arbitrary technical and technological systems.

Research at the ***Department of Machine Design*** is focused on:

- development of design theory and practical implementation of the multi-axis metalworking equipment, including machines of parallel kinematics based on the use of mechatronic drive systems;
- mathematical modeling of the mechanic processes and systems;
- creation of automated machines, CNC machines, machining complexes, and mechanisms on a modular principle;
- research on the dynamics of machines drives, industrial robots, and technological systems;
- development of the theoretical foundations of the design of machine tools, in particular lathes, CNC lathes, and modules, as well as industrial robots and other machines, creating a computer-aided design;
- creation of devices for automation and metal-processing equipment: machine tool modules, automatic machining lines, robotic systems, flexible manufacturing systems;

- theoretical and experimental research of tools and other machines to determine their static and dynamic characteristics, mathematical modeling of machines and their components;
- development and research of high-speed, multi-functional mechanisms of manipulation and clamping of workpieces of machine tools.

5. INTERNATIONAL PROJECTS AND COLLABORATION

IME has 24 active agreements on joint scientific and educational-methodical activities with the following foreign institutions:

- Technical University of Gabrovo (Bulgaria);
- Otto-von-Guericke University Magdeburg (Germany);
- Institute for Machine Tools at the University of Stuttgart (Germany);
- Lublin Polytechnic University (Poland);
- Czestochowa University of Technology (Poland)
- University of Okayama (Japan)
- Faculty of Mechanical Engineering, University of Belgrade (Serbia)
- Zhejiang University (China)
- P.O. Sukhoy Homiel State Technical University (Belarus)
- Belarusian-Russian University (Mogilev, Belarus)
- Tallinn Technical University (Republic of Estonia)
- Warsaw University of Technology (Poland)
- Wroclaw Technical University (Poland)
- University of Petrosani (Romania)
- University Politehnica of Bucharest (Romania)
- The Fluminense Federal University (Brazil)
- Texas Institute of Science (USA)
- University of Toledo (USA)
- University of Warmia and Mazury in Olsztyn (Poland)
- Al-Balqa' Applied University (Jordan)
- Georgian Technical University (Georgia).
- Delcam Plc, Great Britain,
- PTC Inc., USA,
- Autodesk Inc., USA.

IMM maintains permanent relations with higher technical educational institutions of the CIS countries within the framework of the exchange of scientific and technical,

educational and methodological information, joint participation in international scientific conferences and seminars.

The following international structures operate in the **IMM**:

- Center Igor Sikorsky KPI - HAAS;
- Joint Faculty of Mechanical Engineering of Igor Sikorsky KPI and Otto-von-Guericke University of Magdeburg;
- Center Igor Sikorsky KPI - Progrestech Ukraine (Boeing, USA);
- CAD / CAM Joint Center for Technologies. Igor Sikorsky KPI - Delcam, UK;
- Joint Authorized Training Center. Igor Sikorsky KPI - Autodesk, USA

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