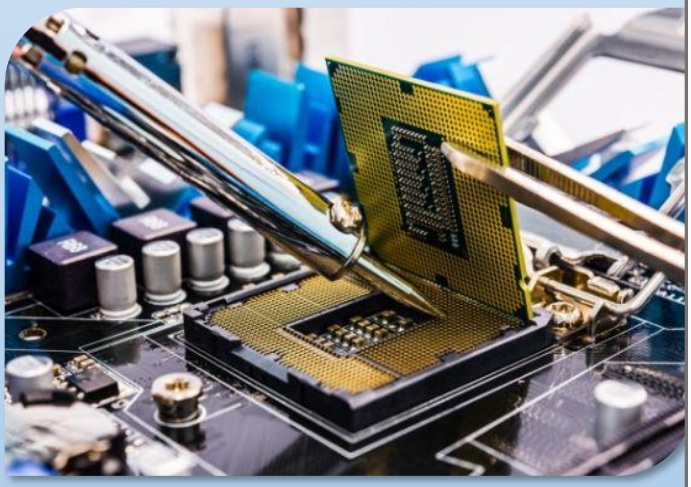
"...development and maintenance of modern instruments and systems: the measuring equipment of onboard complexes, diagnostic complexes of medical and general purposes, controlling devices for energy-saving systems..."



INFORMATION PACKAGE

FACULTY OF INSTRUMENTATION ENGINEERING

Kyiv, 2021

CONTENT

****** 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

Faculty of Instrumentation Engineering (FIE) trains specialists in the development and maintenance of modern devices and systems for various purposes: measuring equipment on-board complexes, diagnostic complexes for medical and general household purposes, control devices for energy-saving systems, etc.

Students acquire extensive knowledge and skills in the use of modern methods of construction of high-precision devices with the use of a microprocessor and computer technology, computer-aided design, and computer graphics.

FIE graduates work at instrument-making enterprises of aviation and space profile, enterprises concerning the introduction of energy-saving technologies, on development and introduction of modern medical diagnostic, training and medical complexes, transport and printing enterprises.

FIE is one of the largest faculties of the Igor Sikorsky KPI and the leading educational and scientific center of instrument making in Ukraine. 96 teachers employ in its four departments, including 14 doctors and 72 candidates of science; about 1,500 full-time and 300 part-time students study in the entire list of instrument-making specialties.

For more than 40 years of its existence, the **Faculty of Instrumentation Engineering** of the Igor Sikorsky KPI has trained more than 11,000 specialists for industry, education, and science, including more than 200 specialists for Bulgaria, Hungary, the Czech Republic, Slovakia, Poland, China, Germany, Vietnam, Cuba, Algeria, Moldova, Azerbaijan, Kazakhstan. Many of them became Doctors of Sciences and PhDs, winners of state awards, government officials, heads of educational and scientific institutions, joint-stock companies, enterprises, firms, institutions. About 10 PhD and doctoral dissertations were prepared and defended by **FIE** graduates from Mongolia, Jordan, Uzbekistan, and Bulgaria. Among the graduates of the faculty, there are- 23 doctors and more than 250 PhD; some of them became government officials at the level of heads of departments of various ministries of Ukraine.

2. STRUCTURE

The **Faculty of Instrumentation Engineering** includes the following departments;

- **Instrument Manufacturing Department;**
- **Department of Computer-Integrated Optical and Navigation Systems;**
- **Department of Automation and Non-Destructive Testing Systems;**
- **Department of Information and Measuring Technologies.**

3. EDUCATIONAL PROGRAMS

Levels of higher education. The training of students in **FIE** is carried out in three levels of higher education.

At the first level (Bachelor's course, I–IV academic years), the students acquire fundamental knowledge in 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.

Students trained in full-time and part-time forms of study.

1. Instrument Manufacturing Department trains specialists under the following Educational Programs:

<table>
<tr><th rowspan="2">Specialty</th><th rowspan="2">Educational Program</th><th colspan="3">Levels of higher education</th></tr>
<tr><th>First</th><th>Second</th><th>Third</th></tr>
<tr><td rowspan="2">Automation and Computer-Integrated Technologies</td><td>Computer-Integrated Systems and Technologies in Instrument Making</td><td rowspan="2">Bachelor
EPP</td><td>Master
EPP
Master
ESP</td><td>–</td></tr>
<tr><td>Automation and Computer-Integrated Technologies</td><td>–</td><td>–</td><td>PhD ESP</td></tr>
<tr><td>Metrology and Information-Measuring Technology</td><td>Metrology and Information-Measuring Technology</td><td>–</td><td>–</td><td>PhD ESP</td></tr>
</table>

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

The educational program "Computer-Integrated Systems and Technologies in Instrument Making" is the latest trend of high-tech, which uses the latest advances in the field of computer and information tools, artificial intelligence, control theory, microprocessor technology, electronics, and automation elements of design and manufacturing processes.

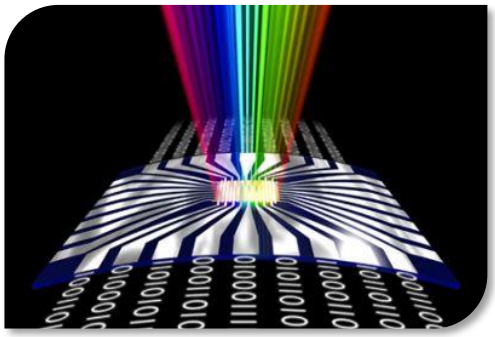
The purpose of the training course is to acquire new information technology by future professionals, their studying of modern computer-aided design (CAD, CAE, CAM, CAD "Catia", etc.), as well as obtaining the necessary knowledge to develop computer-measuring complexes (including the energy-saving industry).

2. Department of Computer-Integrated Optical and Navigation Systems trains specialists under the following Educational Programs:

Specialty	**Educational Program**	**Levels of higher education**		
		First	**Second**	**Third**
Automation and Computer-Integrated Technologies	Computer-Integrated Systems and Technologies in Instrument Making	Bachelor *EPP*	Master *EPP* Master *ESP*	–
	Automation and Computer-Integrated Technologies	–	–	PhD *ESP*
Metrology and Information-Measuring Technology	Metrology and Information-Measuring Technology	–	–	PhD *ESP*

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

Studying in the Igor Sikorsky KPI is a unique possibility of obtaining the state diploma of an educational institution of the highest level of accreditation in the field of applied engineering of optical technologies in Ukraine.



The Department opened the French-Ukrainian master's program with a double diploma of the Igor Sikorsky KPI in the field "Photonics and Optoinformatics". There is also a specialty "Physics. Photonics and optical engineering" opened in

cooperation with the University of Le-Mann. Students participating in the program receive financial support from the Embassy of France in Ukraine.

The main areas of training include the development and implementation of computer technology in the design of orientation, navigation and traffic management, technical and medical diagnostic systems; design of devices and systems for measuring and recording the parameters of motion of physical and biological objects.

During the course, students acquire knowledge of computer technologies, systems CAE-CAD (AutoCAD, SolidWorks, Nastran, Compass), programs for the development of electronic circuits (MicroCAP, LabVIEW), programming languages (Delphi, C ++), systems of mathematical modeling (Matlab, MathCAD), Web-based design. The department has its computer center and modern laboratories in the core disciplines.

3. Department of Automation and Non-Destructive Testing Systems Systems

trains specialists under the following Educational Programs:

<table>
<tr><th rowspan="2">Specialty</th><th rowspan="2">Educational Program</th><th colspan="3">Levels of higher education</th></tr>
<tr><th>First</th><th>Second</th><th>Third</th></tr>
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</table>

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

The main direction of educational work is the training of self-sufficient specialists in the design and operation of systems of non-destructive control of construction materials and technical diagnostics of machinery. At the same time, graduates of the Department receive the necessary training to work in the field of medical engineering.

4. Department of Information and Measuring Technologies

trains specialists under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
Metrology and Information-Measuring Technology	Information-Measuring Technologies	Bachelor *EPP*	Master *EPP*	–
			Master *ESP*	
	Metrology and Information-Measuring Technology	–	–	PhD *ESP*

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

Graduation of bachelor's and master's degrees at the Department of Information and Measuring Technologies are aimed at performing professional research, development, pedagogical, management and innovation works in the field of metrology: development of modern computerized measuring instruments; quality control and evaluation, standardization, certification; development, testing, operation of computer systems and their provision (methodological, algorithmic, software) for obtaining information about the properties and condition of the object; planning and conducting scientific and technical experiments; testing and research of samples of new equipment and new technologies, management of projects and programs in the field of material (intangible) production, technical expertise; control, diagnosis and prediction of the state of technical, biological and natural objects; development, implementation of measurement and information technologies for processing of the information received during measurements.

The training course provides the study of programming, computer technology, electronics, and information measurement technologies for the development and operation of computer measurement systems, research, and comprehensive testing of complex objects.

4. TRAINING AND LABORATORY BASE

Instrument Manufacturing Department has the following specialized training laboratories:

- Laboratory of Microprocessor Engineering and Computer Measurement Systems;
- Laboratory of Computer Technology;
- Laboratory of Conversion Devices;
- Laboratory of Elements of devices and tools for measuring motion parameters;
- Laboratory of Flow measuring instruments;
- Laboratory of Measuring equipment in the energy-saving systems.

Students study:

- MatLab & Simulink - modeling of mathematical models and processes;
- MathCAD - mathematical calculations;
- LabVIEW - a development environment and platform for executing programs created in the graphical programming language "G";
- C ++ programming language;
- SolidWorks - CAD software system for automation of industrial enterprise operations at the stages of design and technological preparation of production;
- CATIA - a computer-aided design system for three-dimensional modeling and real-time teamwork.

Students have at their disposal the following well-equipped training laboratories:

- Laboratory of Physical Principals of Material Processing;
- Laboratory of Device Component technology;
- Laboratory of Device Testing;
- Laboratory of Industrial Processes Automation;
- Laboratory Flexible Manufacturing Systems and Industrial Complexes;
- Laboratory Optoelectronic Methods of Monitoring and Measurement;
- Laboratory Biometrics and Medical Devices;
- Laboratory of Computing Technique.

At the **Department of Automation and Non-Destructive Testing Systems,** there are the following training laboratories:

- Laboratory of Computer Technologies (PC training class);
- Laboratory of Elements and Units of Devices and Systems Design;
- Laboratory of Gyroscopic and Navigation Equipment and Systems;
- Laboratory of Automatic Control Systems of Mobile Units.

Students acquire knowledge and skills to work with different software products for better designing devices and non-destructive testing systems.

Students study:

- MatLab&Simulink – simulation of mathematical models and processes;
- MathCAD – mathematical calculations;
- LabVIEW – development environment and platform for running programs created in the graphical programming language "G";
- PCAD – development of electrical circuit boards for automated systems;
- C++ programming language;
- FemLab – modeling of thermal and electromagnetic processes.

The study of subjects takes place in laboratories:

- Laboratory of Informatics and Computer Science;
- Laboratory of NC solenoid and electronics;
- Laboratory of Optical NDT methods;
- Laboratory of Thermal NDT methods;
- Laboratory of Acoustic NDT methods.

Department of Computer-Integrated Optical and Navigation Systems is equipped with the following laboratories and classrooms:

- "Wave Optics" Laboratory.
- "Applied Optics" Laboratory.
- "Optoelectronic Devices" Laboratory.
- "Optical and Optoelectronic System Testing" Laboratory.
- "Optical Measurements" Laboratory.

During the learning process teachers use the following applications, which were specially designed at the Department:

"Aber" - for computer-aided design of optical systems;

"Ray" - for aberration analysis of optical systems;

"VARIO" - for calculating the two-dimensional and three-lens, mirror and mirror-lens optical systems of zoom with optical image plane shift compensation;

"Condenser" - for the calculation of one-, two- and three-lens condenser;

In the lab course "Optical measurements" a research group of photometric studies operates, where the research work is carried out by students of the Department on the subject of "Methods, means and metrological assurance of measuring energy characteristics of multielement detectors and devices on their basis".

"ASOC" - for aberration synthesis one-, two- and three-lens glued and unglued optical components;

"Radius" - to find the default values of the radii of the spherical surfaces of optical components;

"Tele" - for calculating the dimensional telephoto lenses, etc.

Department of Information and Measuring Technologies has a modern training and research computerized laboratories, connected by two local Ethernet networks with access to the Internet, namely:

- Research Laboratory of Measuring Converters;
- Training Laboratory of Fundamentals of Metrology and Measurement Engineering;
- Research Laboratory of Automation of Metrological Testing of Experimental Informatics;
- Laboratory of Information Technologies in Distance Learning;
- Research Laboratory of Measurement Systems for Multidimensional Processes and Field Physics;
- Non-electric Measurement Research Laboratory;
- Research Laboratory for Measurement of Electrical and Magnetic Values;
- Training Laboratory for Technical Mechanics and Appliance Design;
- Research Laboratory of Measuring Diagnostic Systems;

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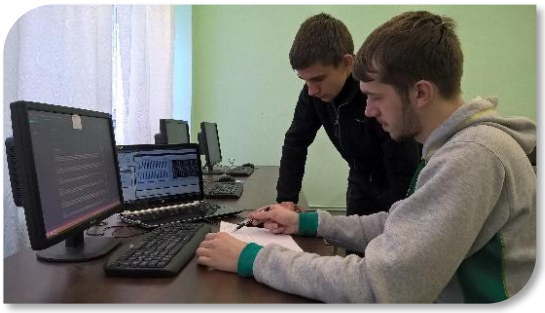
- Educational and Research Laboratory of Microprocessor Engineering and IMS Digital Measurement Converters;
- VDSPL Motorola Digital Signal Processor Virtual Laboratory - certified digital signal processing laboratory with the status of "Motorola Authorized Semiconductor Sector Laboratory for Teaching Students and Professionals in Microprocessors, Microcontrollers, and Digital Signal Processors".



Workplaces in the training laboratories created with the sponsorship of firms are the following:

Motorola

- HC11 / 12 microcontrollers (12 workplaces)
- PowerPC microcontrollers (12 workplaces)
- 68000 microcontrollers (6 workplaces)
- DSP 56000 microcontrollers (8 workplaces)

National Instruments

- LabView (10 workplaces): an introduction with LabView; development of virtual devices in the LabView environment; development of information-measuring systems based on virtual devices; study of metrological characteristics of information-measuring systems.

Infopulse

- NXP LPC/ARM + Embedded Internet DM9000 (10 workplaces)

Texas Instruments

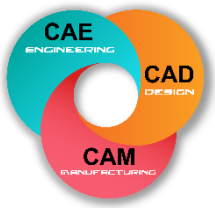
- TMS320C67 13 DSP Starter Kit (10 workplaces)

The level of laboratory equipment allows to carry out research works at the present level according to the plans of preparation of masters, graduate students, and doctoral students. The material and technical base is constantly updated taking into account the needs of research tasks, which are solved by the scientists of the department, graduate students, and students.

5. RESEARCH ACTIVITY

Instrument Manufacturing Department research in the following directions:

- Multi-axis transducers of mechanical quantities;
- Generalization and development of theory and experimental basis of the creation of gravimetric measuring instruments;
- Instruments and methods for measuring pressure;
- Devices and methods of energy-saving;
- Precision mechanical systems and medical devices;
- Development of sensors and transducers of physical quantities and their components for the measurement, monitoring, control, and diagnostics.
- Improving the accuracy and reliability of devices and systems;
- Algorithmic methods of devices and systems;
- Microprocessor technology and information systems;
- Mechanics of elastic elements of the devices and systems;
- The modern system of shock and vibration protection high-precision devices of the aircraft;



- Gravimetric techniques and instruments of measurement;
- CAD / CAE technology for the development of measurement instruments.
- Mathematical modeling techniques and the study of physical processes processing of materials in modern instrument-making industry;
- Creation of intelligent systems production instrument;
- Computer preparation of production devices;
- Creation of laser optical-electronic, vibroacoustic, and electromagnetic diagnostic systems, monitoring and quality control of the production equipment;

- Study of the influence of laser and acoustic radiation biostructures and creation of medical systems based on it;
- Creation of specialized microprocessor systems for dentistry and orthodontics.

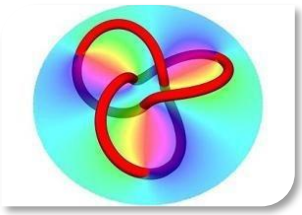
Department has three research and teaching areas:

- Study of the physical fundamentals of materials processing and mathematical modeling of processes in the instrument;

- Study of principles of construction of diagnosing the state of process equipment systems, quality monitoring, and control products;
- Study of principles of construction of medical and systems for medical diagnostics based on biophysical interactions in cellular structures of living organisms.

Department of Computer-Integrated Optical and Navigation Systems research in the following areas:

- Research and development of algorithms and software for information processing, computer-aided design of complex technical systems, which are managed by incomplete and inaccurate information about their condition.
- Creation of a modern element base (solid-state wave gyroscopes, magnetosensitive elements, etc.), systems of orientation, stabilization, and inertial navigation systems, and the development of algorithms and software to correct them.
- Development of instrumentation and algorithms of control and processing of computerized complexes technical and medical diagnostics.
- Design of onboard optical-electronic space-based systems;
- Ophthalmological instrument-making;
- development of optic-electronic devices for minimally invasive clinical medicine;
- Digital optical microscopy;
- Methods and tools for the computer-aided design of optical systems;
- Singular optics;
- Development of instrumentation for the determination of optical instruments and systems performance;



- Methods, tools, and metrology measurement of the energy characteristics of a lot of elemental detectors.

Department of Automation and Non-Destructive Testing Systems performs research activities in the following directions:

- Methods of control of the stress state and fatigue of structural materials;
- Acoustic and eddy-current flaw mobile detectors;
- Ultrasonic methods and devices for medical diagnostics needs;
- Development of precision measuring instruments magnetic and electric fields;
- Electrical methods for mineral exploration;

- Research and development of a thermal method of non-destructive testing;
- Development of techniques to improve the quality of training of specialists in non-destructive testing and technical diagnostics.

Department of Information and Measuring Technologies carry out investigations in the following areas:

- Theoretical foundations of experimental informatics;
- Methodology for building intelligent measuring, control, diagnostics, and expert systems;
- Information-measuring systems, complexes, and fundamental-measuring converters;
- Devices and systems for measuring the characteristics of random signals, measurement methodology;

- Study of electric and magnetic fields;
- Internet metrology;
- Theory of commuting sets;
- Metrology in nanotechnology;
- Metrology and measurement information technologies in distance education, research on monitoring and quality assessment of distance and local testing;
- Scientific and practical principles of information and metrological support for the implementation of technological processes in agricultural production.
- Methods and means of improving the accuracy of the AC voltage measurement;
- Methods of reproducing of the AC voltage unit;
- Metrological support of experimental research;
- Harmonization of national standards with international and European standards;
- Methods and systems for monitoring and diagnostics;
- Methods and software in information technology;
- Digital signal processing;
- Stability study of components of measuring equipment;
- Computer-based ultrasonic non-destructive testing systems;
- Computer systems for electromagnetic field studies;
- Telemetry systems for aircraft testing.

6. INTERNATIONAL PROJECTS AND COLLABORATION

Department of Computer-Integrated Optical and Navigation Systems supports international scientific relations with the Technical University of Dresden, Heidelberg University, University of Bremen, Kirchhoff Institute for Physics (Germany), Instituto Tecnológico de Puebla (Mexico), the Optical center in Juhani (China), University of Amsterdam (Netherlands) Belarusian State University, the European representative offices of firms "the Altera" and "Texas Instrument" (USA).

The department staff took part in scientific conferences of the CIS countries, the USA, England, Germany on automation.

In 2011 the Department opened the French-Ukrainian master's program of receiving two diplomas: Ukrainian the Igor Sikorsky KPI and the European Universite du Maine on Photonics and optoelectronic instrumentation. The program is open to graduates of higher educational institutions of Ukraine with the qualification of "bachelor" in "optical technology".

Department of Automation and Non-Destructive Testing Systems is a member of the World Federation of NDT centers and has close relations with universities in the USA and Germany. Scientists of the Department regularly take part in conferences on nondestructive testing held in Ukraine and abroad. Members of the Department presented their reports and at scientific conferences in the U.S.

The Department collaborates with:

- Universität Würzburg – University Wurzburg (Germany) in the sphere of nuclear magnetic resonance, magnetic resonance imaging.
- Federal Institute for Research and Testing of Materials (Berlin, Germany) in the simulation of the processes during the radiographic testing of materials.

The **Department of Information and Measuring Technologies** maintains direct contacts with the TH Mittelhessen University of Applied Sciences (Gießen, Germany), the Technical Universities of Munich and Trieste, the University of the Bundeswehr, the Zittau / Horlitz University, cooperates with well-known domestic and Western companies "National Instruments", "Analog Devices", "Hewlett Packard", "Rohde & Schwarz", "Siemens", "Motorola" "," Melexis "," Infopulse "," Promsat ". It allows to study and use the advanced world technologies, provides participation of foreign experts in the course of training of students, an exchange of students, teachers, and experts.

The department actively cooperates with the International Association for the Exchange of Students for echnical Experience (IAESTE): every year the best students of the department undergo technological and undergraduate internships in Germany, the USA, Spain, Italy, Greece, Great Britain, Switzerland, France. Students from universities in Great Britain, Denmark, Germany, Sweden, Italy, Switzerland, and Finland are trained at the department .

7. CONTACT INFORMATION

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