"...Welding Faculty of the Igor Sikorsky KPI is recognized in Ukraine and outside as the center of the scientific and methodological work in the field of training of high level professionals involved in the welding industry..."

INFORMATION PACKAGE

WELDING FACULTY

Kyiv, 2016

CONTENT

**** 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.*

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Welding Faculty

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1. COMMON DESCRIPTION AND THE STRUCTURE OF FACULTY

Kyiv is the capital of welding. This opinion is widely spread among welders in Ukraine and abroad and reflects the well-known historical events. Thanks to the outstanding organizational skills and the work of the scientist, the founder of the native school of welders Eugene Paton, Kyiv became the largest center in the world welding science. A separate stage on the way of its development was 1948, when the **Welding Faculty (WF)** was organized at the Igor Sikorsky KPI and was represented initially by only one department of welding production, the first head of which was an outstanding scientist, the founder of the Ukrainian school of welders Professor E.O. Paton.

Now the **Welding Faculty** of the Igor Sikorsky KPI is recognized in Ukraine and outside as the center of the scientific and methodological work in the field of training of high-level professionals involved in the welding industry. In 2008, the **Welding Faculty** was certified by the International Standardizing body of the International Institute of Welding on the training of international welding engineers.

The Faculty's curriculum includes manufacturing practices and internship in leading specialized institutions of the EU countries and the USA for the best students. It is possible to get a second higher education on a contract basis: both economic and according to the special program "International Welding Engineer» (IWE) with awarding of the international certificate. Joint Ukrainian-German Faculty operates ant the WF.

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Structure

Welding Faculty consists of 3 departments.

1. Department of Welding Engineering trains professionals with a degree in "Applied Mechanics" (specialization "Technology and Engineering in Welding").

The curriculum of the Department is aimed at training specialists in the development of welding technology, welding materials with desired properties, mechanical engineering, diagnostics and forecasting of the reliability and performance of welded structures, certification and quality control in production.

Students have the opportunity to participate in international programs of a double degree in cooperation with leading universities in Brazil and Germany, undergo training according to the program of the international system of training in the field of welding: International Welding Engineer (IWE), International Welding Technologist (IWT), International Welding Inspector (IWI).

2. Department of Electric Welding Machines trains experts with a degree in "Applied Mechanics" (specialization "Quality, Standardization, Certification").

Department prepares professionals to develop a new generation of welding equipment and robotic technology systems for welding, welding plant control systems and lines on the ground of micro-computer, and on the base of development and use of mathematical models and artificial intelligence.

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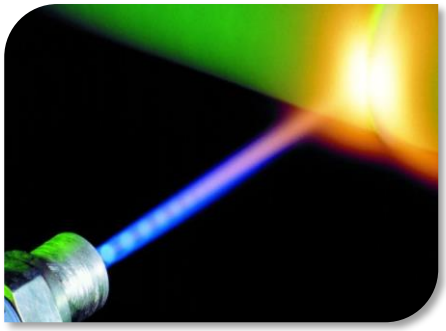
- **3. Department of Surface Engineering** trains experts with a degree in "Material Engineering" (specialization "Engineering and Nanotechnologies of Coatings")



Surface Engineering combines techniques of directed changes in the physicochemical properties of the surface layers by deformation and modification of materials, protective filming, and coatings by various mixed methods.

The list of educational subjects includes both the disciplines of classical engineering education - mathematics, physics, chemistry, electrical engineering and electronics, theoretical mechanics, etc., and special disciplines, defining the profile of the future expert - equipment and technology of vacuum and thermal coating, surface modification, and the like.

The **Faculty's alumni are employed** in the positions of heads and leading specialists of oil and gas enterprises, aerospace, shipbuilding, metallurgy, instrument-making, machine-building and other important sectors of the economy; researchers and developers of welding materials, processes and technologies, computerized and automated production control systems.

2. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students at the FAM is carried out at several levels of higher education. The first (Bachelor's, I-IV years) – the students acquire knowledge in physics, mathematics, mechanics, computing, informatics, and special disciplines. During the IV year, they defend bachelor course work and receive qualification degree Bachelor. At the second level (Magistracy, V - VI years) training is carried out according to the Master's program. Students are trained and acquire relevant skills including laboratory practice. Additionally, students have the opportunity to continue their education in a graduate course, and then in a doctoral candidacy of the University.

Terms of specialists training: Bachelor (b) – 4 years; Master (m) – 2 years (standard terms of training in Bachelor's course and Magistracy), Graduate course / Doctoral candidacy lasts 3 years (4 years by the correspondence study).

Training of specialists is carried out on the full-time and correspondence forms of education.

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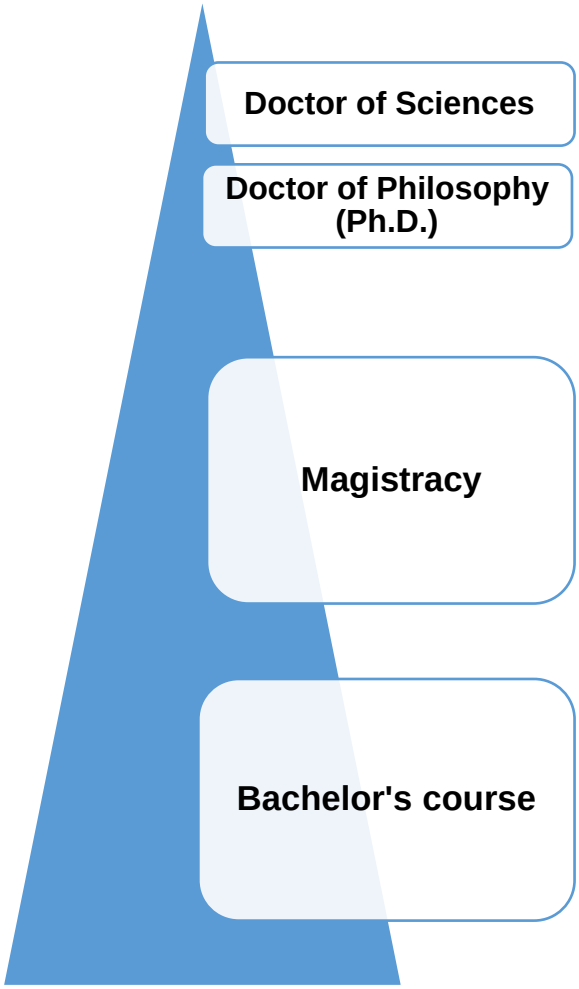
Specialties and specializations of students training



- Welding and Related Processes and Technologies

Applied Mechanics

- Technology and Engineering in Welding
- Automated Technological Systems in Welding

Management

- Quality, Standardization, and Certification

Material Engineering

- Engineering and Nanotechnology of Coatings

The Faculty prepares specialists with fundamental training in general engineering and special disciplines, who are capable of developing the newest technology of modern materials connection, including biological substances, solve the pressing problems of structures fabrication of any material, as well as the development of new welding technology; implement automated and robotic systems, design unmanned technology of welded structures fabrication, carry out scientific research in the field of welding and related technologies.

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3. TRAINING AND LABORATORY BASE

The Faculty has a powerful technical base for training: all the laboratories are supplied with the modern equipment and special training and demonstration systems.

Department of Welding Engineering offers the following laboratories:

- Laboratory of Electron Microscopy and Metal Soldering, where students perform research structures of welded and brazed joints. The laboratory is equipped with modern equipment to carry out research and training tasks related to the study of a particular way of surfacing;
- E.O. Paton Laboratory of Automatic Welding was created in 1978. Modern equipment allows training on fusion welding;
- Laboratory of Stress and Deformation in Welding, which allows students to explore the thermal deformation processes and study mechanisms of residual stresses and strains in models of welded joints;
- Design Laboratory of Welded Structures, where students perform laboratory work to assess the state of stress of welded structures under load.
- Laboratory of Metal Science and Heat Treatment of Welded Joints, which provides equipment to study the effect of different types of heat treatment on the structure of welded joints.
- Laboratory of the Theory of Welding Processes, which offers the equipment to perform training on a cycle of disciplines of theoretical fundamentals of welded joints formation.
- Laboratory of Production Tooling intended to design and build models of assembly and welding equipment and diploma projects fulfillment.

Laboratories of the **Department of Electric Welding Machines**:

- Laboratory of Computing Techniques (computer class);
- Laboratory of Welding Processes Automation;
- Pressure Welding Laboratory;
- Laboratory of Microwelding;
- Laboratory Power Supplies;
- Laboratory of Robotic Welders;
- Welding Laboratory.

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Experimental studies of the **Department of Surface Engineering** are carried out in laboratories, specialized in areas of research and used simultaneously as classrooms where students perform their laboratory works:

- Laboratory of Vacuum-Condensing Deposition and Mechanical Tests;
- Laboratory of Surfacing and Spraying;
- Laboratory of Plasma Spraying.

4. RESEARCH ACTIVITY

The main scientific directions of the faculty

- monitoring of the technical condition of metal structures;
- forecasting of the quality of welded joints based on artificial intelligence methods;
- quality control of welded joints by the electromagnetic effect on metal transfer processes and crystallization of the weld pool;
- research of processes of the phase- structure formation and physicomechanical properties of multifunctional nanostructured coatings;
- study of physical and chemical processes in the plasma spraying and contact impact force with the surface coating base particles formed of complex multicomponent mixtures on the basis of powder materials;
- study of mechanisms of influence of the structure and phase composition of plasma coatings on the adhesion-cohesion, physical and mechanical (strength) properties, crack growth resistance of compositions on the basis of the developed experimental and computational methodology for assessing the nature of the deformation and failure mechanism of the system "basis - coating";
- creation of functional surfaces by welding deposition with the introduction of nanostructured components into the newly created layer;
- research and development of plasma devices in complex plasma-forming mixtures and technologies with their use, settings management, and spatial position of the plasma flow in the processes of surface engineering.

Areas of scientific interest for departments

Department of Welding Engineering carry out the following research:

- welding technology and provision of various materials and constructions for all branches of mechanical engineering;
- patterns of calculating the probable deformations of welded structures for different processes;
- schema definition of key parameters for different ways of welding.

Department of Electric Welding Machines carry out research in the following areas:

- monitoring of the technical condition of metal structures;
- forecasting of the quality of welded joints based on artificial intelligence methods;
- electromagnetic welding process controls techniques.

At the **Department of Surface Engineering** in the framework of science school "Engineering and Nanotechnology of Coatings" investigations are carried out to develop a new sample of equipment and technologies of functional surface layers creation:

- study of mechanisms of influence of the structure and phase composition of plasma coatings on the adhesion-cohesion, physical and mechanical (strength) properties, crack growth resistance of compositions on the basis of the developed experimental and computational methodology for assessing the nature of the deformation and failure mechanism of the system "basis - coating";
- creation of functional surfaces by welding deposition with the introduction of nanostructured components into the newly created layer;
- research and development of plasma devices in complex plasma-forming mixtures and technologies with their use, settings management, and spatial position of the plasma flow in the processes of surface engineering.
- study of physical and chemical properties and the development of technologies for the use of hydrogen-oxygen flame for thermal spray materials processing.

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5. INTERNATIONAL PROJECTS AND COLLABORATION

Welding Department is actively working on the international stage. In particular, the faculty employees are the active members of the International Institute of Welding, the European Welding Federation and the International Union of experts on quality and other professional societies. The Faculty has the license for the training program of the International Institute of Welding. According to this program, senior students of the faculty are trained annually. All the departments of the faculty participate in the international work.

Departments involved in the scientific and technical projects in the framework of agreements with foreign partners, among which:

- Federal University of Uberlandia (Brazil);
- Otto-von-Guericke University Magdeburg (Germany);
- Guangdong General Research Institute of Industrial Technology (China);
- Mexican Corporation of Research in Materials (Mexico).

Departments involved in international educational projects. In particular, students have the opportunity to study on the program of double diploma education of Master level in Germany and Brazil, participate in programs of short-term training in leading universities of the world, teaching in summer schools.

Employees of the Department of Electric Welding Machines are actively involved in the work of technical commissions and research groups of the International Institute of Welding. The cooperation is carried out under the agreements on joint scientific and educational-methodical activity with 12 foreign universities:

- Otto-von-Guericke University Magdeburg (Germany);
- Federal University of Uberlandia (Brazil);
- Institute of Dunaujvaros (Hungary);
- Harbin Institute of Technology (China);
- Mazandaran University of Science and Technology (Iran);
- Polytechnic University of Valencia (Spain);
- Huazhong University of Science and Technology Wuhan (China);
- The Central University of Las Villas, Santa Clara (Cuba);
- The Silesian University of Technology, Gliwice (Poland);

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- The Catholic University of Parana, Curitiba (Brazil);
- Tallinn University of Technology (Estonia);
- St. Petersburg State Technical University (Russia).

6. CONTACT INFORMATION

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