

**«...specialists in the field of nanoelectronics, biomedical electronics, acoustics and acousto-electronics, telecommunications and industrial electronics. Graduates confidently use modern computer design technology, are skilled in developing and operating of electronic and acoustic apparatuses, devices and systems...»**



**INFORMATION  
PACKAGE**

**FACULTY  
OF ELECTRONICS**

**Kyiv, 2020**

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## CONTENT

1. COMMON DESCRIPTION AND THE STRUCTURE OF FACULTY .....	2
2. EDUCATIONAL PROGRAMS.....	6
3. TRAINING AND LABORATORY BASE.....	8
4. RESEARCH ACTIVITY .....	10
5. INTERNATIONAL PROJECTS AND COLLABORATION.....	13
6. CONTACT INFORMATION.....	16

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



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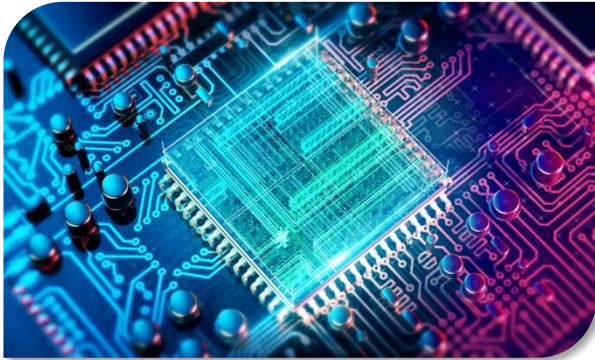
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# 1. COMMON DESCRIPTION AND THE STRUCTURE OF FACULTY

Today there is a steady tendency of the transition of electronic equipment to the world of digital electronics. Graduates of the **Faculty of Electronics (FEL)**, on the one



hand, should be qualified in service of modern electronic technics, and on the other - have sufficient qualifications, theoretical knowledge, practical skills in modern technologies and element base for creating competitive electronic equipment.

The training of qualified professionals in electronics, electrical engineering, as well as in the areas that are related to computerization, is impossible without the real scientific and technological activities of our faculty specialists. The **Faculty of Electronics (FEL)** was founded in October 1962 and consisted of three departments. Today more than 1,000 students are training at the **FEL**, including 28 foreigners.

The faculty trains specialists in the field of micro- and nanoelectronics, biomedical electronics, acoustics, and acoustoelectronics, multimedia electronic systems, telecommunications, and industrial electronics. Graduates confidently use modern computer design technology, are skilled in developing and operating electronic and acoustic apparatuses, devices, and systems for a wide range of destinations.

## Structure

**Faculty of Electronics consists of 7 departments and 3 inter-departmental laboratories. On the basis of the faculty operates Research Institute of Applied Electronics and Microsystems Engineering**

### 1. Department of Microelectronics

as a leader in the field of solid-state electronics in Ukraine established many internationally recognized schools of science. Department trains experts with a degree in "Micro and Nanosystem Engineering", educational program "Micro- and Nanoelectronics").

The modern world is impossible to imagine without electronics, which covers all areas of human activity. Micro- and nanoelectronic technologies are the basis of all areas of modern electronics - computer technology, telecommunications, avionics, space and medical technology, energy. The educational process at the department is aimed at a deep understanding of the processes and phenomena that occur in any electronic system. Therefore, according to many years of experience, graduates of the Department of Microelectronics easily adapt in all areas related to electronics.



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The Department of Microelectronics, in addition to professional training, provides the most fundamental and universal education in informatics, computer science, computer technology, mathematics, physics, materials science, and subject-oriented programming for the design of micro- and nanoelectronic devices and devices as well as for the development of manufacturing technologies. Such education is competitive in the labor market and guarantees graduates a prestigious job, allowing them to both work in the industry and engage in research.

Creating new, competitive products requires not only the use of modern technology and design techniques but also the use of the ideas of functional electronics based on microcircuit principles of physical phenomena and effects in solids. Various apparatus are made using these effects: solid-state lasers, optical-electronic means of communication, and holographic systems for processing of super-large data arrays, piezoelectric, and magnetic functional elements.

**2. Department of Electronic Devices and Systems** trains experts with a degree in Electronics, educational programs “Electronic Components and Systems” and “Electronic Equipment and Devices”).

Training is carried out in the framework of educational and scientific school “Physics and Technology of Electronic Devices for Information and Applied-Physics Systems”. Based on the fundamental physical and mathematical technological schemes of professional education and research cycles, Department provides multidisciplinary training of bachelors, masters, and PhDs for the research, design, organizational-methodical, scientific, and teaching activities in the field of research, design, production, and operation of multipurpose electronic devices.



Training of specialists at the department involves obtaining skills on:

- the development and design of the general-purpose microprocessor devices and systems for control and regulation ;
- development and design of power electronic devices and systems for conversion and regulation of electricity parameters;
- computer methods of information design and processing;
- use of information computer equipment in control and display devices;
- operation and maintenance of electronic equipment for general use

The curricula for the preparation of bachelors and masters are subject to constant updating based on coordination with the basic enterprises "Melexis-Ukraine", "Kostal-Ukraine", "Di-Elcom" and other specialized enterprises of the industry.



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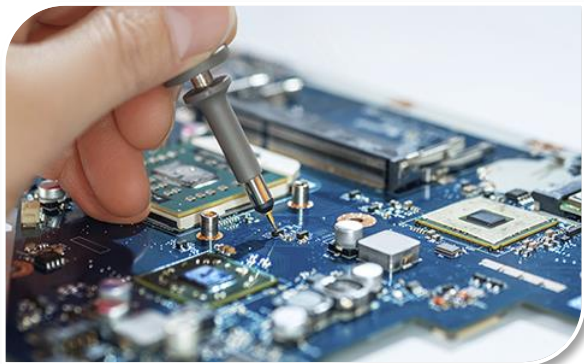
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**4. Department of Electronic Engineering** trains experts with a degree in "Micro- and Nanosystem Engineering", the educational program "Electronic Micro- and Nanosystems and Technologies". The program focuses on research, development, implementation, and application of modern electronic micro- and nanodevices and



systems, methods and technologies for their manufacture using modern information technologies, including electronic micro- and nanosystems for biomedical purposes.

The department trains professionals in the field of integrated micro- and nanoelectronics, development, and implementation of computer medical diagnostic systems, computer simulation of microelectronic devices and equipment, the design of components for telecommunication systems, the creation of automatic analysis of measured data.

The main advantage of training at the Department of Electronic Engineering is that the primary attention is paid to thorough training of students in fundamental disciplines: mathematics, programming, working with modern software for design and simulation of electronic circuits PSpice, OrCAD, P-CAD, analog, and digital circuitry. circuitry, microcircuitry, modern microprocessor technology, signal and image processing, medical introscopy. This knowledge becomes the basis for the free choice of specialization of master's training.

The department provides international mobility in micro- and nano electronics and nanotechnologies, including biomedical systems and technologies at the world's leading universities, internships, and double master's and doctoral degrees at universities in France, Belgium, Germany, Spain, Japan, South Korea by agreement programs.

The department has opened a laboratory for analog design of micro- and nanoschemes with the ability to obtain certificates from licensed computer-aided design systems for micro-and nanochips from CADENCE.

**5. Department of Acoustics and Multimedia Electronic Systems** trains experts with a degree in Electronics, educational programs "Acoustic Electronic Systems and Technologies of Acoustic Information Processing" and "Electronic multimedia systems and the Internet of Things").



Acoustics are used in various fields, such as architecture, industry, medicine, music events.



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The main task of an acoustic engineer, regardless of the industry, is to provide a comfortable pastime for the listener in rooms where there is sound. Acoustic engineers work to reduce noise levels in residential, commercial, or public spaces. They are working on the introduction of innovative technologies and new materials. They advise construction companies to ensure optimal sound insulation, in industrial enterprises, acoustic engineers help reduce noise and vibration from working machines.

Acoustic engineers are extremely needed in medicine; they develop and maintain complex medical equipment, such as modern human hearing diagnostics, digital hearing aids, and cochlear implants, ultrasound diagnostics and therapies, ultrasound surgical devices.

Students learn how to use the application software for acoustic signal and image processing, mathematical and virtual modeling, and the design of acoustic devices and systems. Considerable attention is paid to the design of ultrasonic computer introscopy and tomography systems, measuring and diagnostic equipment, development of acoustic instruments, equipment for home and professional recording studios, and the like.

In course of master's training, the department proposes a double degree program in acoustoelectronics jointly with the Universite du Maine, Le Mans, France. The program of scientific internships of doctors of philosophy operates with the same university.

Based on the concluded agreements on cooperation and partnership in the field of acoustics and electronics, the curricula of the department are constantly coordinated with the needs of partner companies. They are State Enterprise "Kyiv Scientific Research Institute of HYDRODEVICES" (Ukrainian Defence Industry "UKROBORONPROM"), State Enterprise "Prof. Kolomyichenko Institute of Otolaryngology of the National Academy of Medical Sciences of Ukraine", State Academic Orchestra "RadioBand of Oleksandr Fokin", LLC "ULTRAKON-SERVICE", and LLC "MAG AUDIO".

Jointly with the State Academic Orchestra "RadioBand of Olexander Fokin" department performs training of students upon the dual form of higher education based on the certificate program "Audio Producing" for the master's level of higher education.

**6. Department of Electronic Computing Equipment** trains experts with a degree in "Telecommunication and Radio Engineering" (educational program "Information-Computing Facilities for Radioelectronic Systems").



Department graduates are capable:

- develop information systems and electronic computing machines, "systems-on crystal" (SoC) based on the single-crystal CISC, RISC and ARM microcontrollers, digital signal processors DSP and FPGA;

- develop software with the use of Arduino, C, C ++, Assembler, PHP, MySQL, Verilog, and VHDL, be

skilled in HTML and CSS, use applied software packages Arduino-IDE, MatLab, OrCAD, Altium Designer, Quartus II, AVR and Code Composer Studio, IAR



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Workbench, as well as a tool for programming of measuring and control computer complexes LabVIEW;

- create databases, develop own utilities and program systems on the high-level languages, create own web pages and sites, organize various web services;
- design, deploy, adjust the setting and maintain computer networks with the use of technologies Wi-Fi, Bluetooth, Ethernet, DSL, ZigBee, personally build any kind of network: both the home and large corporate one;
- fulfill the creation of electronic devices, beginning with the development of circuit, algorithmic, software, and design solutions and finishing in its manufacturing.

**Research Institute of Electronics and Microsystem Engineering** engaged in the development and implementation of modern electronic equipment and devices for industry, energetics, communications, and medicine. The main directions of Institute activity: control stations for protection of microprocessor-controlled electric motors; parallel type compensators of reactive power based on IGBT modules; charge-discharge and charge-stabilizing devices; uninterruptible power supply systems; piezoelectric motors for automation systems; piezoceramic electrical filters; photovoltaic panels and inverters; sensors and sensor systems of automation; electrosurgical devices; computer security systems VisaNet <sup>TM</sup>

## 2. EDUCATIONAL PROGRAMS

**Levels of higher education.** Training of students at the FEL is carried out at several levels of higher education. At the first level (Bachelor's course, I – IV years) the students acquire fundamental knowledge in physics, mathematics, mechanics, computer engineering, and special disciplines. During the IV year, they defend their bachelor's thesis and receive Bachelor's qualification degree.



At the second level, (Master's course, I – II years) training is carried out according to the Master 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 training:** Bachelor (b) – 4 years; Master (m) – 2 years (educational and scientific training program) or 1.5 years (educational and professional training program), postgraduate study - 4 years (full-time, evening, correspondence forms).



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### Specialties and educational programs:

Doctor of  
Sciences

#### Micro and Nanosystem Engineering

#### Electronics

#### Telecommunication and Radio Engineering

Doctor of  
Philosophy  
(Ph.D.)

Master's course

#### Micro and Nanosystem Engineering

- Micro and Nanoelectronics
- Electronic Micro- and Nanosystems and Technologies

#### Electronics

- Electronic Devices and Equipment
- Electronic Components and Systems
- Acoustic Electronic Systems and Technologies of Acoustic Information Processing
- Electronic Systems of Multimedia and Internet of Things Tools

Bachelor's  
course

#### Telecommunication and Radio Engineering

- Information and Computing Facilities for Electronic Systems

Graduates of FEL **are fluent in** modern computer technology design, to **develop and operate** electronic and acoustic instruments, multipurpose devices, and systems.



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**Students acquire knowledge and skills of:**

**Electronic systems**

**Biomedical electronics**

**Acoustics and  
acoustoelectronics**

**Telecommunication  
systems**

**Industrial electronics**

**Nanoelectronics**

### **3. TRAINING AND LABORATORY BASE**

Laboratory of the Tower Semiconductor Ltd. equipped with modern systems for the design of micro- and nanoelectronic systems operates at the **Department of Electronic Engineering**.

The department also has a Group on biomedical electronics and analysis of biomedical signals, which develops methods and systems for diagnosing human diseases based on measuring the activity of the brain, heart, muscles, etc.

The **Department of Electronic Devices and Systems** has a laboratory of indicator devices, where several high-tech digital devices for processing X-ray images for industrial and medical purposes are currently developed.

The laboratory is developing a hardware video processor VP-063, designed to work as part of the equipment of industrial X-ray television flaw detectors. There are significant results in the field of image format conversion. These developments are carried out by students and graduate students under the scientific guidance of teachers of the department.

The department has a branded laboratory equipped with modern equipment of Melexis-Ukraine - the world leader in analog electronics.

Training at the **Department of Industrial Electronics** is provided by:

- Laboratory of the Theory of Electrical Circuits and Electromagnetic Systems;
- Laboratory of Electronic and Microprocessor Devices and Systems;
- Laboratory of Computer and Internet Technology;
- Laboratory of Power Electronic Devices and Systems;



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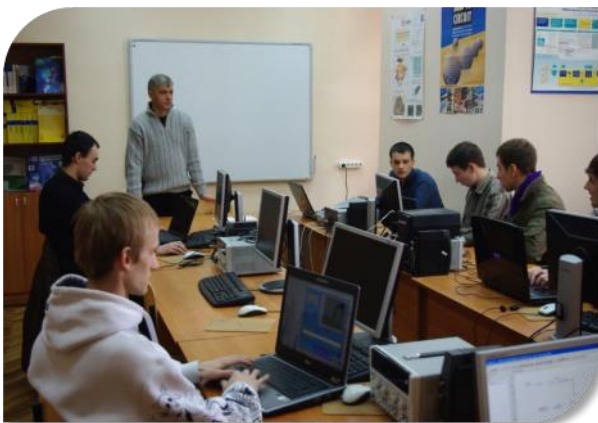


- Laboratory of Microprocessor Control Systems MicroGrid and SmartGrid;
- Laboratory of Power Electronic Systems;
- Laboratory of Devices and Systems for Information Display and Registration;
- Laboratory of Computer Equipment and Computer Systems;
- Laboratory of Electronic Computer Systems.

**Department of Acoustics and Multimedia Electronic Systems** has the Laboratory of Examination and Correction for providing advice to students, organizations, and individuals for the acoustic examination and correction, as well as the implementation of educational and practical projects.

The department has modern laboratories: functional units of telecommunication systems and EMC, measuring systems, radio receivers, power supply and electromagnetic compatibility of electronic equipment, magnetic recording systems, ultrasonic measuring transducers of physical quantities, equipment, and operation of film installations, applied television and applied television. of computer technologies of audiovisual content processing. The department has a certificate for student training under the Cisco program.

**Department of Electronic Computing Equipment** uses in the learning process



some modern laboratory facilities in the form of evaluation modules of type DE2, DE5 from the firm ALTERA, BeagleBoard on the base of OMAP3, BeagleBone Black on the base of ARM Cortex A8, circuit boards on the base of platforms C28x, C55x, C64x and MSP430, ASLK-PRO from the firm TEXAS INSTRUMENTS, C51, AVR from the firm ATMEL, STM32 from the firm STMicroelectronics, Arduino Leonardo,

portable solutions for wireless technologies in the form of ZigBee-modules Tmote Sky, microcomputers Intel Galileo and Intel Edison, telecommunication facilities Cisco.

Official Training Center of Teaching of PLD Designing Technologies from ALTERA and Educational Laboratory of TEXAS INSTRUMENTS, Scientific Training Center "Lean production" operate at the department, as well as 6 teaching and research laboratories: Laboratory of Digital Technology Digital Lab, Laboratory of Microprocessor Devices, Laboratory of the Physical Fundamentals of Microelectronics, Laboratory of Information Technologies, Laboratory of Analog and Digital Electronics, and Open Laboratory LAMPA on its base.



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In the LAMPA laboratory, students of the department, faculty, and university study electronics in extracurricular time, create prototypes of diploma and course projects and develop their startup projects using the above electronic modules.

## 4. RESEARCH ACTIVITY

### *The main researching areas of the Department of Microelectronics:*

- Physics of semiconductor and dielectric materials;
- Synthesis of new materials for electronics;
- Renewable sources of energy, photovoltaics;
- Piezoelectric devices and equipment;
- Microelectronic sensors, the functional elements of the electronics;
- Dielectric microwave components and devices;
- New semiconductor devices;
- Computer technology;
- Ultrasonic sensors, vibration sensors;
- Microwave measuring cell for  $tg$  measuring in the range 5.20 GHz;
- The microstructure of composite materials;
- Device for power supply controlling of computers;
- New amorphous semiconductors and composites.



### *Areas of research at the Department of Electronic Devices and Systems:*

- Analysis and synthesis of gate transducers of the fixed and variable structure;
- The mathematical basis of microprocessor control algorithms and digital signal processing;
- Devices and systems of power electronics;
- Energy-efficient power management in electrical complexes and systems MicroGrid and SmartGrid.
- Intelligent processing of big data in systems with distributed generation of electric energy;
- Internet of Things technologies in electronics;
- Methods of analysis and monitoring of biotelemetric indicators.



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Permanent seminars (once or twice per month) of the National Academy of Sciences of Ukraine "Semiconductor transducers in the industrial electronic devices" are organized by the department, where academic staff, students, and postgraduates can test the results of their scientific investigations.

***Scientific teams and laboratories that work at the Department of Electronic Engineering:***

- A team on biomedical electronics and signal analysis;
- A team on micro- and nanoelectronics;
- A team on microwave electronics;
- Laboratory of Biophysics;
- The research group of the weak electrical activity of the heart.

***The Department of Acoustic and Multimedia Electronic Systems carries out the following research projects:***

- Systems of automatic speech recognition;
- Acoustic elements of security systems;
- Identification of interlocutors;
- Secret voice recording system;
- Application of technologies and technical means of intelligent networks to ensure the exchange of information at a distance;
- Networks and multi-channel telecommunication systems;
- Systems and technical means of radio and television broadcasting, electroacoustics and voice informatics, multimedia equipment;
- Systems and technical means of information protection in telecommunication systems;
- Satellite and mobile communication systems;
- Application of modern technologies and technical means of registration and reproduction of information in information systems for industrial, public, and household purposes;
- Systems and technical means of audio and video information reproduction for large human contingents, limited contingents, individuals;
- Systems and technical means of registration and processing of scientific, technical, and production information;
- Management of operational and service maintenance of audio and video equipment;
- Voice and video information compression systems;
- Electromagnetic compatibility of electronic equipment.



***Research directions of the Department of Electronic Computing Equipment:***



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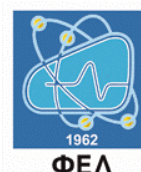
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- Design the “systems on a chip” (“System-on-a-Chip” - SoC), “networks on a chip” (“Network-on-a-Chip” - NoC), and electronic computing problem-oriented systems for various functional purposes, including the number of "Embedded Systems" for recognition and automatic tracking of objects based on modern ARM, DSP, and SoC technologies.
- Research in the field of intelligent electronic information systems, including artificial intelligence, expert systems, fuzzy systems, and decision-making systems. Research and development of the concept of open-closed systems (OS-System) and development on this basis of adaptive programming technology - an environment for creating correct information technology systems for various purposes.
- Intelligent information networks, the methodology of construction of multi-information networks, intelligent control and monitoring system in multiservice networks;
- Computer telephony systems, coding, and synthesis of speech in IP-telephony, the IP network security systems;
- Implementation of methods of modern "lean production", including the management of the quality, environment, occupational safety and occupational health, food safety, information security, integrated management systems, industrial management systems based on international standards of ISO 9000, ISO 14000, ISO 22000, ISO 27000, OHSAS18000; SA8000 and IRIS.

**The international scientific and technical conferences** that are held at **FEL**:

- The annual conference of young scientists "Electronics",
- Every two years - the international scientific and technical conference "Problems of modern electrical engineering" with the publication of scientific papers of the authors in the journal "Technical electrodynamics", which is included in the List of professional publications of Ukraine and the international scientific base Scopus,
- Annual international scientific and technical conference EInano under the aegis of IEEE with the publication of scientific reports of authors in the digital library IEEEExplore and the international scientometric base Scopus.

Scientific journals : “Microsystems, Electronics and Acoustics” and “Electronic and Acoustic Engineering” are issued at the Faculty of Electronics.



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## 5. INTERNATIONAL PROJECTS AND COLLABORATION

Faculty of Electronics participates in the program of dual master's degree in Microelectronics together with the Electronics Packaging Lab (IAVT) of the Dresden University of Technology (Germany).

Faculty signed contracts on academic exchange and agreements on research cooperation with the KTH Royal Institute of Technology, Stockholm (Sweden); Korea Institute of Science and Technology (South Korea); Central School of Electronics, Paris (France); College of Engineering, Korea University (South Korea); Yonsei College of Electronics (South Korea); Parthenope University of Naples (Italy), Riga Technical University (Latvia), Wroclaw University of Technology (Poland)

**The Faculty has a long history of international cooperation and is well known in the world. Many teachers and students are members of international organizations CODATA and IEEE**

**Department of Microelectronics** cooperates with Germany (Berlin Federal Institute for Materials Research and Testing, universities of Aachen, Duisburg), France (universities of Paris, Limoges), Czech Republic (University and the Institute of Physics in Prague), the Netherlands (Delft University), Portugal (University of Aveiro).

**Department of Electronic Device and Equipment** provides students with the opportunity, starting from the second year, to participate in the program "Double Diploma", established in cooperation with the Technical University Dresden (Technische Universität Dresden). The fourth and fifth-year students who have successfully enrolled in the program and have mastered the German language course, TRAINS in the laboratories of the Technical University Dresden, as well as perform their course and degree projects. Students who have completed a training course on the program "Double Diploma" on a competitive basis can go to graduate school at Technical University Dresden.

International relations of the activity in two directions: training of a foreigner and inter-university cooperation.

Department performs joint projects with foreign partners:

- Technical University Dresden – scientific work and training of young scientists, graduate, and post-graduate students, joint research on the transmission of information signals on the electric grids;



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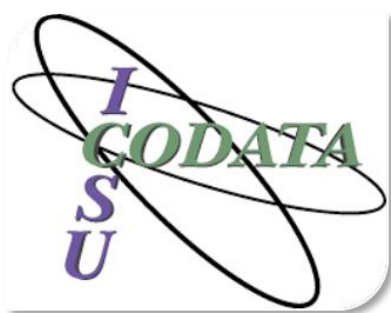
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- The University of Zielona Góra, the Maritime Academy of Gdynia (Poland), Ritsumeikan University, Kyoto (Japan), Tallinn University of Technology (Estonia), Georgian Technical University, Tbilisi (Georgia) - joint research in the field of power electronics, converter equipment, systems and algorithms of signal control and processing, participation in competitions of joint Ukrainian-Japanese research projects;
- Riga Technical University, Latvia (scientific training, inter-university cooperation agreements, review of articles and co-organization of international conferences);
- Wrocław University of Technology (academic mobility of students and scientific and pedagogical personnel in the framework of Erasmus+ project, joint research).

Students and teachers of the **Department of Electronic Engineering** are the



members of the international scientific organizations: Institute of Electrical and Electronics Engineers (IEEE), Engineering in Medicine and Biology Society, Microwave Society, Communication Society, CODATA.

Scientific collaboration between FEL and research groups at foreign academic and scientific research centers and companies is in progress, namely: with the Institute of Biomedical Engineering TU Dresden on the analysis of

heart rhythm variability and classification of sleep stages; with Tesco (Seoul, Republic of Korea) for the development and production of equipment for telecommunication systems testing.

As part of the double degree programs, undergraduate students have the possibility of simultaneous theoretical and practical training both in the Igor Sikorsky KPI and in Germany or South Korea. Students of the Department take part in two double degree programs: with the Technical University Dresden in the field of "Production of micro- and nanoelectronic devices," "Biomedical Electronics" and with the Korea Advanced Institute of Science and Technology.

**Department has the agreements on international exchanges with the following foreign educational institutions:**

**Royal University of Technology, Stockholm (Sweden),  
Ecole Centrale d'Electronique, Paris (France),  
College of Engineering, Korea University (S. Korea),  
College of Electronics, Yonsei University (S. Korea),  
Parthenope University of Naples (Italy)**

Teachers and scientists of the **Department of Acoustics and Multimedia Electronic Systems** maintain creative contacts with colleagues from Germany, Poland, the USA, Hungary, Bulgaria, the Czech Republic, and Slovakia. The Department organized the Ukrainian Branch of the international Audio Engineering Society (AES).



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**Department of Electronic Computing Equipment** fruitfully cooperates with leading international companies in the field of electronics as Altera (USA) and Texas Instruments (USA).



The work of the official Training Center for Product Design Technologies from Altera in Ukraine is performed based on new educational and scientific laboratory Digital Lab technologies within the frame of international program ATPP (Altera Training Partner Program). The activity of the Texas Instruments Training Laboratory is performed according to the international program Texas Instruments.

The Department is also cooperating with the Belgian company Melexis. Students are training in techniques of digital design and testing of integrated microchips in general Educational and Scientific Laboratory Igor Sikorsky KPI - Melexis.



Within the framework of the partnership and cooperation agreement with the leading IT company "GlobalLogic Ukraine" with its financial assistance, the department established a training and research laboratory "KPI - GlobalLogic Ukraine" to design embedded technology solutions.

Also, the Department organizes and conducts international seminars in the enterprises of the Republic of Belarus and Kazakhstan in the form of training of internal auditors in quality management systems, energy management, environmental management, and the management of the food industry following the requirements of the international standards ISO9001, ISO19011, ISO50001, ISO22000, ISO22002, and ISO14001.



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