"...radio engineering methods are used in data transmission systems,
radio communications,
radio broadcasting, television,
radiolocation, radio navigation,
radio control, automation and
computer engineering..."

INFORMATION PACKAGE

FACULTY OF
RADIO ENGINEERING

Kyiv, 2023

CONTENT

*** *The information provided is current as of the 2023/2024 academic year.*

Please note that minor changes may occur in the list of training specialties and educational programs/specializations for the next academic year.

1. COMMON DESCRIPTION OF THE FACULTY

Faculty of Radio Engineering (FRE) was established based on the radio laboratory of the electrical engineering faculty of Kyiv Polytechnic Institute, founded by V.V. Ohiyevskiy in 1921.

First electric engineers in radio specialty were graduated in 1928. In 1930 the faculty of electrical engineering was separated and reorganized into Kyiv Power Engineering Institute, in which the radio-engineering faculty and the department of radio engineering were established. The faculty and the department were headed by prof. V.V. Ohiyevskiy. 1930 is considered the year of birth of the **Faculty of Radio Engineering** of the Igor Sikorsky KPI. The regular graduation of radio engineers has started in 1931.

Faculty of Radio Engineering prepares highly skilled professionals capable of working efficiently at all stages of the design and manufacturing of modern electronic devices and systems: satellite communication (GPS, GLONASS, Galileo, VSAT) and mobile (GSM, CDMA); wired (including optical lines) and wireless computer networks (Wi-Fi, Bluetooth); television and telecommunications systems (WiMAX, LTE, DVB-T2) special communication systems; microprocessor and computer control systems for domestic and industrial purposes; biotechnical and medical diagnosis and treatment systems; robotics and mechatronic systems.

Students of the **Faculty of Radio Engineering** complete the practice and work at enterprises not only in Ukraine but also abroad. Our graduates can be found in manufacturing plants: "Huawei Ukraine", «Dialog Semiconductor», LLC "KOSTAL UKRAINE", "Quasar", "Quantum", "The Kyiv Factory "Radar", "Holding Company Ukrspetstechnika", "RPE "Kvant-Efir", "Romsat", "Arsenal", "UkrNDIRA", "Beam "and others. Also, our graduates work in most companies, satellite, and mobile communications, and Internet service providers: Lifecell, Kyivstar, Lanet, Volya, Freshtel, etc; in radio and television companies: STB, 1+1, Inter, Ukraina, and others; in research institutes and various medical institutions of Ukraine. Traditionally, the Security Service of Ukraine, the Foreign Intelligence Service of Ukraine, the Ministry of Internal Affairs of Ukraine, the State Customs Service, and other government agencies that have special departments of technical control and maintenance are interested in hiring our graduates. Most graduates work in foreign companies and their Ukrainian representative offices: Ericsson, Melexis, Luxsoft, Infineon Technologies, National Instruments, Cisco Systems, Huawei, Siemens, and others.

Foreign Economic Activity Office
tel. +38044 204 83 81
forea@kpi.ua
forea.kpi.ua/

Faculty of Radio Engineering
tel. +38 097 165 98 56; +38 044 204 92 93
rtf@kpi.ua
rtf.kpi.ua

2. STRUCTURE

Radio Engineering Faculty consists of three departments:

1. **Department of Radio Engineering;**
2. **Department of Radio Engineering Systems;**
3. **Department of Applied Radio Electronics,**

as well as four laboratories:

- **Educational and Research Laboratory KPI-Qualitech**
- **Educational and Research Laboratory of Space Radio Engineering Systems**
- **Educational and Research Laboratory of Network Technologies and Systems**
- **Educational and Research Laboratory DATACOM**

3. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students at the **FRE** is carried out at three levels of higher education.

At the first level (Bachelor's course, I-IV academic years) students acquire fundamental knowledge in physics, mathematics, mechanics, computing, informatics, 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 to defend a master's thesis and acquire a Master's 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 (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.

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1. Department of Radio Engineering provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	**Second**	**Third**
172 Electronic Communications and Radio Engineering	Radio Electronic Engineering	–	Master *ESP*	–
	Information and Communication Radio Engineering	Bachelor *EPP*	Master *EPP*	–
	Telecommunications and Radio Engineering	–	–	Ph.D. *ESP*

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

Students receive a deep insight into intelligent antenna systems for various purposes,

theoretical foundation and methods of engineering realization of radiation units, reception and spatio-temporal processing of information in satellite, telecommunications, and medical systems, theory and practical aspects of electronic circuits, theory and practical aspects of signal used in electronic devices and systems, theory and practical aspects of analog and digital signal processing, fundamental course of electrodynamics and propagation of radio waves. Each area of training is supported by laboratory practice, where students gain valuable experience working with electronic measuring equipment, such as spectrum analyzers, vector analyzers, generators, etc.

2. Department of Radio Engineering Systems provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	**Second**	**Third**
172 Electronic Communications and Radio Engineering	Radio Electronic Engineering	–	Master *ESP*	–
	Radio Technical Computerised Systems	Bachelor *EPP*	Master *EPP*	–
	Telecommunications and Radio Engineering	–	–	Ph.D. *ESP*

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

Students in-depth learn information transmission theory, in which one considers systems of modern television, mobile communication systems of the second, third, fourth, and fifth generations, local communication between devices over WiFi, Bluetooth, ZigBee; information extraction systems, which includes radar systems, navigation systems; destruction of the enemy system's information and the protection of

private information; digital signal generation algorithms and their implementation on digital signal processors; modulation and coding techniques, adaptive digital signal processing techniques.

Students also study digital and analog electronics; programming of microcontrollers and microcomputers; adaptive, software-defined, and special communication systems; modern information technologies; signal processing in communications systems; radio monitoring; methods and algorithms of digital processing of multidimensional signals; the identification, recognition, and restoration of signals and images; sophisticated digital filtering algorithms; artificial intelligence systems and neural networks in signal processing.

3. Department of Applied Radio Electronics provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	**Second**	**Third**
172 Telecommunications and Radio Engineering	Intelligent Technologies of Radioelectronic Equipment	Bachelor *EPP*	Master *ESP*	–
	Radio Electronic Engineering	–	Master *ESP*	–
	Telecommunications and Radio Engineering	–	–	Ph.D. *ESP*

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

Students study intelligent systems, the principles of intellectualization of electronic
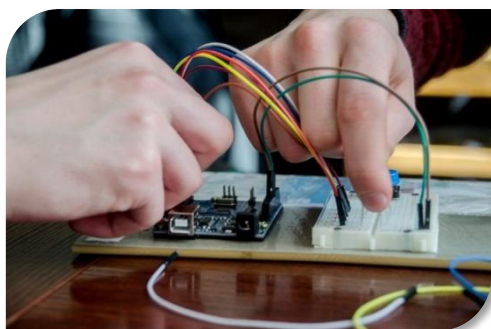
equipment based on programmable microprocessors, design and technology fundamentals of telecommunications radio and electronic engineering, intelligent technology in the functioning of electronic equipment, its design, manufacturing, and operation, fundamentals of micro - and nanosystem technology, hardware-software means universal and special purpose for the design and operation of electronic telecommunication equipment.

Educational and Research Laboratory "KPI-Qualitech" was established to train applicants for higher education, training, and practical engineering skills to work with modern radio technologies based on the Department of Theoretical Foundations of Radio Engineering at the Radio Engineering Faculty using equipment from world-famous companies for radio measuring equipment Rohde&Schwartz Advantest, as well as National Instruments, a world leader in virtual instrument technology, development, and production of systems and software for automated testing systems.

5. Educational and Research Laboratory of Space Radio Engineering Systems

The main tasks of the laboratory are to promote the quality of training in the field of design of space radio systems, namely: onboard and terrestrial radio receiving and transmitting systems, power systems of onboard electronic equipment, design, and technology of onboard electronic systems, long-range space radio systems, deployable antenna systems, onboard active headlights, electronic equipment for scientific payload,

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radar systems for remote sensing of the Earth, space radiometers, development of the theory of the construction of space radio systems, research and development in the direction of designing onboard radio systems.

6. Educational and Research Laboratory of Network Technologies and Systems

The RTF educational process uses a modern laboratory of network technologies equipped with specialized telecommunication devices Cisco, MikroTik, D-Link, TP-Link, etc. This creates the best conditions for independent and scientific work, and course and diploma design allows the implementation of the concept of continuous computer training of radio engineers in all areas.

The laboratory is used for teaching professional disciplines to RTF students f in the disciplines: "Fundamentals of Internet Technologies and Computer Networks", and "Fundamentals of Electronic Communications Networks".

Practical works are carried out in the laboratory both offline and online. Elements of the Cisco CCNA R&S training course are used in teaching. During the classes, students have the opportunity to gain practical skills in computer network design, wireless and wired LAN switching, configuring CISCO, MikroTik, TP-Link network equipment using real units, and its simulation using the Cisco Packet Tracer software package.

The laboratory has Cisco routers and switches, MikroTik, and TP-Link switches.

RTF Network Technologies Laboratory was established to support innovative student projects for the development of software and hardware solutions, and research in the framework of scientific and educational projects of the faculty.

7. Educational and Research Laboratory DATACOM

DATACOM Laboratory was established jointly by the Igor Sikorsky KPI and Huawei - one of the world leaders in the production of telecommunications equipment. The laboratory was designed to teach students the principles of construction and operation of telecommunications networks.

Detailed attention is paid to computer networks, which are studied in the discipline of "Telecommunication Networks".

The program is based on Huawei's HCIA-Datacom course materials. It considers in detail the information transfer, network devices and their functions, and the architecture of modern data transmission networks. The DATACOM laboratory is equipped with powerful modern Huawei equipment, which allows students to apply the acquired knowledge in practice and acquire skills in designing, setting up, and maintaining computer networks.

After mastering the discipline, students have the opportunity to take an exam at Huawei to obtain a certificate of HCIA-Datacom specialist.

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4. TRAINING AND LABORATORY BASE

Radio Engineering Faculty is housed in a separate building, which has lecture halls, equipped with multimedia learning tools, modern computer classrooms, and specialized laboratories to conduct educational and scientific research using both classical and modern instrumentation.

> **Faculty of Radio Engineering has specialized laboratories**

The Department of Radio Engineering has the following laboratories:

- Training Laboratory of Satellite Information Systems;
- Training Laboratory of Radio Measurements;
- Training Laboratory of Medical Equipment;
- Training Laboratory of Computer Radio Circuits, Signals, and Microwave Devices;
- Antenna Training Laboratory;
- Training Laboratory of Electrodynamics And Microwave Devices;
- Training Laboratory of Radio Circuits And Signals;
- Training Laboratory of Basics Of Radio Electronics.
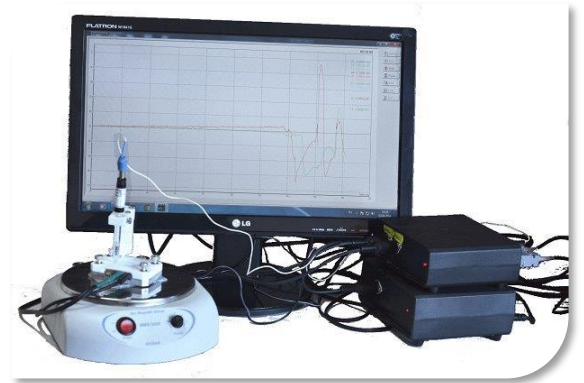
The Department of Radio Engineering Systems has the following laboratories:

- Training Laboratory for Digital Signal Processing;
- Laboratory of Radio Transmitting Devices;
- Laboratory of Electronic Vacuum Microwave Devices;
- Laboratory of Basics of Television Devices and Systems;
- Training Laboratory of Radio Engineering Systems;
- Computer Laboratories;
- Laboratory of Electronic Component Base.

The Department of Applied Radio Electronics has the following laboratories:

- Laboratory of Computer-aided Design;
- Microelectronics Laboratory;
- Technological Laboratory of Microelectronics;
- Laboratory of Digital Device;

- Computer Class of Electronic and Computer Facilities for Developing Multimedia;
- Training Laboratory of Digital TV;
- Computer Class of Software Development for Electronic Equipment;
- Laboratory of Radio Receivers and Analog Circuits;
- Laboratory of design of electronic equipment;
- Laboratory of Materials Science and Technology of Electronic Equipment;
- Laboratory of Medical Electronic Apparatus.

5. RESEARCH ACTIVITY

Scientific fields of the *Department of Radio Engineering:*

- Theory and technique of multi-band and multi-beam mirror antenna systems; dual-polarized broadband micro stripe antenna arrays; ultra-broadband vibrator antenna arrays; micro stripe adaptive antenna phased arrays; ultra-broadband mirror antennas; microwave devices for converting the polarization of radio signals of ultra-high-frequency devices of separation of radio signals with orthogonal linear and circular polarizations (orthomodular transducer); microwave devices for separation of channels of transmission and receiving of radio signals; one-and dual broadband irradiated mirror antennas with low cross-polarized radiation;
- Electrodynamics of periodic structures, activation, and propagation of electromagnetic waves;
- Electrodynamics of anisotropic environment, nonreciprocal low-frequency devices;
- Methods and means of pulse diagnostics; bioimpedancemetry and impedance tomography; phasemetry i spatial phase synchronization;
- Enhancing sensitivity and resistance against the interference of communication systems;
- Coding of the spectral envelope of the speech signal, digital vector signal processing;
- Radio engineering and sensor devices for medical diagnostics;
- Signal theory;
- Methods of digital signal processing and pattern recognition in non-traditional coordinate bases;
- Methods and means of impedance tomography;
- Speech coding, speech signal compression algorithms;

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- Devices and systems of HF and microwave radio communication, information security, and technological measurements;
- Development and research of nanosatellite radio communication systems;
- Physics and technology of powerful ultrasound;
- Radio devices and systems for the Internet of Things (IoT);
- Creating digital communications.

Scientific fields of the *Department of Radio Engineering Systems:*

- Theory and technique of digital formation and processing of complex radar and radio navigation signals;
- Design of microwave transceiver modules;
- Development of software and hardware for forensic research;
- Information systems and special purpose complexes;
- Methods of digital optimal and adaptive signal processing in radio systems;
- Adaptive methods of signal processing in radio networks;
- Digital communication theory. Mobile radio systems;
- Numerical methods of device modeling.

Scientific fields of the *Department of Applied Radio Electronics:*

- Computer-aided design of integrated circuits and components on printed circuit boards;
- Mathematical models of physical processes in electronic devices;
- The study of electromagnetic compatibility. Development and improvement of means and measures of protection of the information;
- Development of software and hardware on microcontrollers and embedded microcomputers;
- System short-range radar. Non-linear radiolocation;
- Creation and implementation of methods and tools for functional and nanoelectronics;
- The theoretical basis of crystal structures of devices for processing signals;
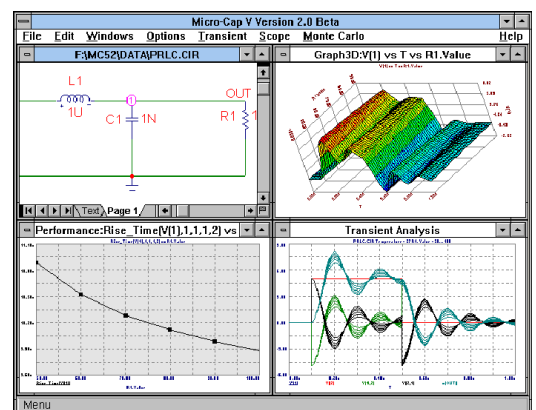
- Investigation of precision ultra-sensitive fiber-optical accelerometers;
- Study of medical and engineering principles for the creation of medical information-diagnostic systems of millimeter range;
- The formation of surface layers by ion implantation;
- Compression of speech signals based on transforms with an adaptive selection of the coefficients;
- Radiometry and microwave measurements of weak signals. Study of interaction of electromagnetic fields with physical and biological objects;
- Research of processes of interaction of laser radiation with biological objects for diagnostics of oncological diseases;
- Study of the effect of microwave radiation on biological objects and parameters of solution;s
- Study of ultrasonic atomization of liquids. Non-destructive ultrasonic testing.

6. INTERNATIONAL COLLABORATION

Students and teachers of the **Faculty of Radio Engineering** have the opportunity to participate in academic exchange programs with more than 70 universities in the EU, China, the USA, and others.

Partner universities:

- Czech Technical University of Prague
- Queen Mary University of London
- McMaster University of Canada

To ensure the quality of the educational process, the **Department of Radio Engineering Systems** has contracted with EDAis Ltd and Cadence Design Systems Inc. to obtain licensed NI AWR Design Environment (National Instruments), OrCAD software packages.

The Faculty cooperates with the following organizations: MikroTik, Nuvoton, Wurth Elektronik, and Huawei.

In 2015-2019, the faculty developed a prototype of a compact portable system of prevention and counteraction in the detection of hidden weapons (knives, pistols, and grenades) on the human body under the program "Science for Peace and Security" (NATO grant)

A cooperation agreement was concluded with the Prague Technical University (Czech Republic) - Faculty of Electrical Engineering (FEL, ČVUT), according to which the academic mobility of masters and graduate students is carried out.

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rtf@kpi.ua
rtf.kpi.ua

A cooperation agreement has been concluded within the European Erasmus + program with Queen Mary University of London (London, United Kingdom).

As part of the ARM University Program, the Faculty of Radio Engineering received the STM32F401 Nucleo and STM32F4 Discovery debug boards for in-depth study of ARM microcontrollers (STM32) with floating-point hardware (DSP) hardware support.

7. CONTACT INFORMATION

1. Dean: Ph.D. in Technics, Assoc. Prof., Ruslan V. Antypenko
Address: Ed. Build.No17, 12, Polytechnichna Str., Kyiv, Ukraine, 03056
Phone:+380-44-204-92-93, +380-44-362-83-42
E-mail: *r.antypenko@kpi.ua, rtf@kpi.ua*
Official website: *rtf.kpi.ua*

2. Department of Radio Engineering
Phone: +380-44-204-93-92, +380-44-204-83-41
Official website: ri.kpi.ua

3. Department of Radio Engineering Systems
Phone: +380-44-204-92-97
Official website: rts.kpi.ua

4. Department of Applied Radio Electronics
Phones: +380-44-204-94-20
Official website: re.kpi.ua

Foreign Economic Activity Office
tel. +38044 204 83 81
forea@kpi.ua
forea.kpi.ua/

Faculty of Radio Engineering
tel. +38 097 165 98 56; +38 044 204 92 93
rtf@kpi.ua
rtf.kpi.ua