



# [RE-344] COMMUNICATION MEANS IN INTELLIGENT RADIO ELECTRONIC SYSTEMS. COURSEWORK



## Work program of the academic discipline (Syllabus)

### Course details

Level of higher education	First (bachelor's)
Field of knowledge	G Engineering, Manufacturing and Construction
Specialization	G5 Electronics, Electronic Communications, Instrument
Engineering and Radio Engineering	
Educational program	Intelligent Technologies of Radio Electronics
Status of discipline	Regulatory
Form of higher education	Full-time
Year of training, semester	4th year, fall semester
Scope of the discipline	1 credit (lectures, practical classes, laboratory classes, independent work: 30 hours)
Semester control/control measures	Credit
Class schedule	<a href="https://schedule.kpi.ua">https://schedule.kpi.ua</a>
Language of instruction	Ukrainian Information
about course coordinator/teachers	<a href="#"><u>Yezersky N. V.</u></a>

## Curriculum

### 1. Description of the academic discipline, its purpose, subject matter, and learning outcomes

The purpose of the course project is to acquire and consolidate skills in calculating individual components of communication devices at the level of structural diagrams of receiving and transmitting devices: consolidate the theoretical knowledge gained; learn how to calculate a receiving device and individual blocks of its path, taking into account operating conditions; acquire skills for independent resolution of technical issues; learn to use technical reference literature; learn to correctly draw up electrical diagrams and prepare technical documentation

### 2. Prerequisites and post-requisites of the discipline (place in the structural-logical scheme of training under the relevant educational program)

The coursework is based on the following disciplines: Design and production technologies of intelligent radio-electronic equipment, Communication methods in intelligent radio-electronic systems, Communication means in intelligent radio-electronic systems

#### General competencies

GC 01 Ability to think abstractly, analyze, and synthesize

GC 02 Ability to apply knowledge in practical situations.

GC 04 Knowledge and understanding of the subject area and understanding of professional activity.

GC 07 Ability to learn and master modern knowledge.

GC 08 Ability to identify, pose, and solve problems.

#### Professional competencies

PC 01 Ability to understand the essence and significance of information in the development of modern information society

PC 03 Ability to use basic methods, means, and tools for obtaining, transmitting, processing, and storing information.

PC 04 Ability to perform computer modeling of devices, systems, and processes using universal application software packages.

PC 05 Ability to use regulatory and legal documentation related to information and telecommunications networks, telecommunications and radio engineering systems (laws of Ukraine, technical regulations, international and national standards, recommendations of the International Telecommunication Union, etc.) to solve professional tasks

PC 06 Ability to perform instrumental measurements in information and telecommunications networks, telecommunications and radio engineering systems.

PC 09 Ability to accept and master new equipment in accordance with current standards.

PC 10 Ability to install, debug, configure, adjust, test, and commission telecommunications and radio engineering structures, facilities, and equipment.

PC 12 Ability to perform work related to managing the load flows of information and telecommunications networks.

PC 14 Willingness to study scientific and technical information, domestic and foreign experience on the subject of investment (or other) projects for telecommunications and radio engineering equipment.

PC 15 Ability to perform calculations in the process of designing structures and means of information and telecommunication networks, telecommunication and radio engineering systems, in accordance with technical specifications using both standard and independently developed methods, techniques, and software tools for design automation

PC 16 Ability to apply standard calculation methods in the design of telecommunications and radio engineering devices and systems

PC 20 Ability to select methods and means of information processing using intelligent technologies

PC 21 Ability to apply a comprehensive approach to the development of radio-electronic equipment

PC 22 Ability to select and critically evaluate and choose technical solutions at all stages of the development and design of radio-electronic equipment using intelligent technologies

### **Program learning outcomes**

PLO 01 Analyze and make informed decisions when solving specialized tasks and practical problems in telecommunications and radio engineering, which are characterized by complexity and incomplete certainty of conditions

PLO 04 Explain the results obtained from measurements in terms of their significance and relate them to the relevant theory.

PLO 08 Describe the principles and procedures used in telecommunications systems, information and telecommunications networks, and radio engineering

PLO 14 Application of understanding of the basic properties of the component base to ensure the quality and reliability of telecommunications and radio engineering systems and devices.

PLO 16 Application of understanding of the basics of metrology and standardization in the field of telecommunications and radio engineering in professional activities.

PLO 19 Perform standard tests of information and communication networks, telecommunications and radio engineering systems for compliance with the requirements of domestic and international regulatory documents.

PLO 21 Ensure reliable and high-quality operation of information and communication networks, telecommunications and radio engineering systems.

PLO 23 Explain the principles of construction and operation of hardware and software complexes of control and maintenance systems for the development, analysis, and operation of information and telecommunications networks, telecommunications and radio engineering systems.

PLO 25 Select and implement means and methods of information transmission in communication networks and apply network technologies

PLO 26 Design and implement elements of intelligent technologies using software-configurable equipment

PLO 29 Select the configuration, structure, main components, and elements of radio-electronic equipment depending on its purpose

PLO 30 Apply a comprehensive approach to the design of telecommunications and radio-electronic equipment

PLO 32 Apply the basic principles of diagnostics, control, and testing of radio-electronic equipment at the main stages of production using intelligent technologies

### **3. Course content**

Perform preliminary design of a superheterodyne radio receiver:

- 1) select the type of receiver block diagram;
- 2) calculation of the operating frequency band of the receiving device;
- 3) determination of the input circuit structure;
- 4) distribution of amplification between receiver paths;
- 5) assessment of the dynamic range;
- 6) development of a receiver control system;
- 7) presentation of the developed structural diagram of the receiving device.

### **4. Learning materials and resources**

#### *Main*

1. Ilnytskyi L.Ya. Ultra-high frequency devices and antennas: textbook/ Ilnytskyi L.Ya., Sibruk L.V., Shcherbina O.A. – Kyiv: NAU, 2013. – 188 p.
2. Theory and practice of radio frequency resource management: textbook / P.V. Slobodyanyuk, T.M. Narytnyk, V.G. Blagodarny, V.G. Saiko, V.L. Bulgach; ed.: V.G. Kryvuts. – Kyiv: DUIKT, 2012. – 595 p.
3. Vasilenko, D. O. Ultra-high frequency devices: Coursework (Part 1. Narrowband matching of complex loads) [Electronic resource]: textbook / D. O. Vasilenko. – Kyiv: Igor Sikorsky KPI, 2021. – 79 p.  
Access: <https://ela.kpi.ua/handle/123456789/45719>.
4. Vasilenko, D. O. Ultra-high frequency devices. Coursework (Part 2. Broadband load matching) [Electronic resource]: textbook / D. O. Vasilenko. – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2022. – 63 p. – Access: <https://ela.kpi.ua/handle/123456789/50549>

#### *Additional*

1. Skrypnyk, Yu. O. Modulation radiometric devices and systems of the microwave range: textbook. / Skrypnyk, Yu. O., Manoilov, V. P., Yanenko, O. P. – Zhytomyr: ZHTI Publishing House, 2010. – 374 p.
2. Panfilov, I. P., Dyda, V. Yu., Kapatsin, A. V. Theory of Electrical Communication: Textbook for universities of the first and second levels of accreditation. – Kyiv: Tekhnika, 1998.
3. Pozar, D.M. Microwave Engineering / David M. Pozar – 4th ed. – John Wiley & Sons, 2012. – 752 p.

### **Educational content**

### **5. Methodology for mastering the academic discipline (educational component)**

...The completion of the course work consists of a series of stages, which are outlined below:

- 1) Formulation and analysis of technical tasks
- 2) Selection and justification of the structural diagram of the receiving and transmitting device
- 3) Calculation of the main components and parameters of the transceiver
- 4) Checking the coursework
- 5) Defense of coursework

## **6. Independent work by the student**

- 1) Receiving the topic and assignment for the coursework
- 2) Analysis of the task, selection and study of literature
- 3) Performing calculations required by the assignment
- 4) Preparation of an explanatory note for the coursework
- 5) Preparation of diagrams and specifications

## **Policy and control**

### **7. Policy of the academic discipline (educational component)**

The coursework must be prepared in accordance with the requirements for research reports (DSTU 3008-2015 "State Standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and rules of preparation").

All illustrative material in the course work must be prepared using computer tools. The content of the illustrative material must sufficiently reflect the main provisions that are being defended.

Both the instructor and the student are required to adhere to the Code of Integrity of the National Technical University of Ukraine "Kyiv Polytechnic Institute."

The main provisions of the academic discipline policy:

- the topic of the coursework may be consistent with the topic of the future bachelor's thesis;
- the stages of the course work must be completed in accordance with the established work schedule;
- the developed structural diagram of the receiving device and the diagrams of its blocks must be confirmed by the results of calculations of their main parameters;
- in case of academic misconduct and plagiarism, the course work is returned for complete reworking with a possible change in the assignment;
- late completion of a stage of the coursework will result in a 10% reduction in the explanatory note component of the assessment if the delay is no more than two weeks, and a 20% reduction if the delay is more than two weeks.

Coursework is assessed taking into account the following factors:

- completeness of the individual assignment for the coursework;
- correctness and validity of the developed schemes;
- timeliness of the coursework in accordance with the schedule;
- independence in completing the coursework and absence of signs of plagiarism;
- answers to questions about the content of the coursework during its defense.

### **8. Types of control and rating system for assessing learning outcomes**

The coursework is completed in parts throughout the semester. When studying a particular topic, 2-3 weeks are given to complete the relevant part of the coursework. Grades are given according to a rating system on a 100-point scale.

Type of work	Point s
Analysis of the task, selection of the type of receiver block diagram;	10
Calculation of the operating frequency band of the receiving device; determination of the input circuit structure;	10
Distribution of amplification between receiver paths;	10
Evaluation of the dynamic range;	10
Developing a receiver control system;	10
Presentation of the developed structural diagram of the receiving device	10
Defense of work	40

**Table of correspondence between rating points and university scale grades**

<b>Number of points</b>	<b>Grade</b>
100-95	Excellent
94	Very good
84	Good
74-65	Satisfactory
64-60	Sufficient
Less than 60	Unsatisfactory
Admission requirements not met	Not admitted

## **9. Additional information on the discipline (educational component)**

No additional requirements

*Description of material, technical, and informational support for the discipline*

Performed by students on their own PCs

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Work program for the academic discipline (syllabus):

**Compiled by** [Movchanuk A. V.](#); [Yezersky N. V.](#);

**Approved by** the PRE Department (Minutes No. 06/2025 dated 06/25/2025)

**Approved by** the methodological commission of the faculty/research institute (protocol No. 06/2025 dated 26.06.2025)