



ANTENNAS. COURSEWORK (PN-03)

Work program of the academic discipline (Syllabus)

Course details

Level of higher education	<i>First (bachelor's)</i>
Field of knowledge	<i>G - Engineering, manufacturing, and construction</i>
Special	<i>G5 - Electronics, electronic communications, instrument engineering, and radio engineering</i>
Educational program	<i>Information and communication radioengineering</i>
Status of discipline	<i>Compulsory (standard) (professional training cycle)</i>
Form of study	<i>Full-time and accelerated full-time (daytime) Part-time and accelerated part-time</i>
Year of training, semester	<i>4th year, 7th semester (full-time and part-time), 3rd year, 5th semester (full-time accelerated and part-time accelerated)</i>
Scope of the discipline	<i>Total: (1.0 credit) 30 hours Practical classes: 14 hours (full-time) Self-study by students: 16 hours (full-time) Practical classes: 2 hours (part-time) Self-study by students: 28 hours (part-time)</i>
Semester control/control measures	<i>Credit</i>
Class schedule	https://schedule.kpi.ua/
Language of instruction	<i>Ukrainian</i>
Information about the course leader/teachers	<i>Practical, SS: Ph.D., Associate Professor of the Radioengineering Department Serhii Martyniuk (Martyniuk.Sergii@LLL.kpi.ua), +38 066 298 37 00</i>
Course location	<i>The course is hosted on the Sikorsky distance learning platform: https://do.ipo.kpi.ua/course/view.php?id=8356</i>

Curriculum

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

The academic discipline "Antennas. Coursework" is one of the compulsory disciplines of professional training. It belongs to the PN-03 professional training cycle of the professional educational program, which provides theoretical knowledge and practical skills in calculating various classic types of antennas that are necessary for a radio engineer.

Reasons and motivation for studying: the necessity of the academic discipline "Antennas. Coursework" is to consolidate, deepen, and generalize the theoretical knowledge and practical skills that students acquire while studying the discipline "Antennas," understanding the physical principles of operation and the basics of designing classic types of antennas.

The aim of teaching the discipline is to develop knowledge about the methods and means of antenna design, the principles of calculating their parameters, and the basic technological operations of the production process.

The subject of the discipline is the basic methods of antenna design, calculation of their main technical characteristics, and determination of operating conditions.

As a result of training, students develop:

General competencies (GC)

GC-03 – Ability to plan and manage time.

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

GC-08 – Ability to identify, set, and solve problems.

Professional competencies (PC)

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

PC-16 – Ability to calculate the basic parameters of various types of antennas and microwave devices, select the most effective antennas and microwave devices for radio engineering systems with specified operating modes and functional characteristics, experimentally investigate the characteristics of microwave devices and antennas of various designs and frequency ranges.

PC-17 – Ability to apply modern CAD systems for the design, structural synthesis, and highly efficient multi-parameter optimization of antennas, active and passive microwave devices.

Studying the discipline "Antennas. Coursework" contributes to the achievement of the following program learning results.

Program learning results (PLR)

LOU-02 – Apply the results of personal search and analysis of information to solve qualitative and quantitative problems of a similar nature in information and communication networks, telecommunications and radio engineering systems.

PRL-07 – Competently apply the terminology of the telecommunications and radio engineering industry.

PRL-24 – Perform calculations, numerical optimization, and design of antennas and microwave devices, active microwave receiving systems using modern CAD systems.

Within the framework of the above-mentioned general and professional competencies and program learning results, students should:

- know the physical principles of antenna operation and their components;
- the main technical characteristics of the most important components;
- the modeling and calculation methods used at the development stage;
- be able to use the acquired knowledge in the design of antennas and the operation of equipment in which they are included;

Students gain experience working with individual components of the above-mentioned technology and their application in the creation of antennas and antenna systems.

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

Interdisciplinary connections are determined by the place of the discipline "Antennas" in the educational and professional training program for specialists in the field of electronics and telecommunications.

To successfully study the discipline "Antennas. Coursework" (PN-03), students must master the material and have certain knowledge, abilities, and skills in such disciplines as:

- "Higher Mathematics" (GN-03);
- "General Physics" (GN-10);
- "Microwave Devices" (PN-10);
- "Antennas" (PN-11);
- "Design of Microwave Receiving Devices" (PN-12).

The discipline "Antennas. Coursework" provides for the study of disciplines of the first (bachelor's) level of higher education:

- "Automated Design of Antennas and Microwave Devices" (PN-06);
- "Design and manufacture of microwave equipment" (PN-15);
- as well as during diploma design.

3. Contents of the academic discipline

The coursework is performed as an individual assignment and is prepared for defense at the end of the theoretical training period. The coursework must be prepared for defense within the time frame specified in the assignment and agreed upon with the instructor.

Explanatory note

The explanatory note is submitted for the defense of the course work and contains:

- title page;
- technical assignment;
- table of contents;
- introduction;
- main part (antenna design 1, results of calculation of main parameters);

- main part (antenna design 2, results of calculating the main parameters);
- main part (antenna design 3, results of calculating the main parameters);
- conclusions;
- list of references.

Main stages of coursework completion

- receiving the topic and assignment;
- analysis of the task;
- selection and study of literature;
- selection and justification of antenna design-1;
- calculation of the main parameters of antenna-1;
- selection and justification of antenna-2 design;
- calculation of the main parameters of antenna-2;
- selection and justification of antenna-3 design;
- calculation of the main parameters of antenna-3;
- preparation of an explanatory note;
- submission of the explanatory note for review;
- defending the coursework.

4. Teaching materials and resources

Recommended reading

Main

1. Kupriy O.M. *Antennas. Lecture notes*. – Kyiv: KPI, 2025. – 250 p.
2. Martynyuk, S. E. *Antennas: Coursework* [Electronic resource]: textbook for students majoring in G5 "Electronics, Electronic Communications, Instrument Engineering, and Radio Engineering" / S. E. Martynyuk, O. M. Kupriy; Igor Sikorsky Kyiv Polytechnic Institute. – Electronic text data (1 file: 1.2 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2026. – 39 p. – Title from the screen.
3. V. M. Shokalo, V. I. Pravda, V. A. Usin, V. S. Vuntesmeri, D. V. Grechykh. *Electrodynamics and Radio Wave Propagation*. — Part 1 — 2009 — 287 p.; Part 2 — 2010 — 435 p. — Kharkiv.
4. Thomas A. Milligan. *Modern Antenna Design*, 2nd ed. — 2005 — 663 p.
5. C. A. Balanis. *Antenna Theory, Analysis and Design*, 2nd ed. — Wiley, New York, 1997.
6. V. H. Rumsey. *Frequency Independent Antennas*. — Academic Press, New York, 1966.
7. Ilnytskyi L. Ya., Savchenko O. Ya., Sibruk L. V. *Antennas and Ultra-High Frequency Devices*. Textbook for Higher Education Institutions. Edited by L. Ya. Ilnytskyi. — Kyiv: Ukrtelecom, 2003. — 496 p.
8. D. O. Vasilenko. *Narrowband and Broadband Matching of Complex Loads*. — Kyiv: KPI, 2015. — 60 p.

Additional

1. Pozar D.M. *Microwave engineering*. 4th edition. Wiley, 2021, 656 p.

2. DSTU GOST 2.001:2006 Unified system of design documentation. General provisions (GOST 2.001-93, IDT).
3. DSTU GOST 2.051:2006 Unified system of design documentation. Electronic documents. General provisions (GOST 2.051-2006, IDT).
4. DSTU ISO 5457:2006 (ISO 5457:1999, IDT) National Standard of Ukraine. Technical documentation for products. Drawings. Dimensions and formats.
5. DSTU GOST 2.702:2013 ESKD. Rules for the execution of electrical diagrams (GOST 2.702-2011, IDT).
6. DSTU 3008-2015 "State Standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and rules of design."

Information resources

- Microwaves101.com (Microwave Encyclopedia) [Electronic resource] – Access mode: <https://www.microwaves101.com>.

Educational content

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

The completion of the coursework (CR) consists of nine stages, which are listed in the table:

Semester week	Name of the stage of work
1	Receiving the topic and assignment
2	Analysis of the assignment
4	Selection and study of literature
6-8	Selection and justification of the Antenna-1 design Selection and justification of Antenna-2 design Selection and justification of Antenna-3 design
9	Design of Antenna-1 Design of Antenna-2 Design of Antenna-3
12	Calculation of basic parameters Antenna-1 Calculation of basic parameters Antenna-2 Calculation of main parameters Antenna-3
13	Preparation of explanatory note
14	Submission of coursework for review
15	Defense of term paper

6. Self-study of the student

No	Title of the topic for independent study	Number of hours SS
1	Receiving the topic and assignment for the course paper	1
2	Analysis of the assignment, selection and study of literature	5
3	Development of antenna design and calculation of its parameters (Antenna-1, Antenna-2, Antenna-3)	20
4	Preparation of an explanatory note for the course work	4
	Total:	30

Policy and control

7. Policy of the academic discipline (educational component)

Formatting

The formatting of the course paper must comply with the requirements for research reports (DSTU 3008-2015 "State Standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and formatting rules").

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

Both the teacher 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 course paper 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 designs of antennas and antenna systems must be confirmed by the results of calculations of their main parameters;
- in case of academic dishonesty 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.

Assessment

The coursework is assessed taking into account the following factors:

- completeness of the individual assignment for the coursework;
- correctness and validity of the developed designs;
- 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 (RSA)

The system for assessing student performance in the discipline "Antennas. Coursework" is based on the "Regulations on the system of assessment of learning outcomes at Igor Sikorsky KPI" (https://document.kpi.ua/files/2020_1-273.pdf), namely the Rating System of Assessment (RSA) of the second type (RSA-2).

The RAS-2 of the coursework (R_k) has two components:

- initial (R_c);
- defense component (R_3).

$$R_k = R_s + R_z .$$

The *first* (starting) component R_c characterizes the student's work on the coursework and its result — the quality of the explanatory note and the developed designs.

The *second* component R_3 characterizes the quality of the student's defense of the coursework.

The scale for the first component is 60 points, and for the second component, 40 points. The quality of the explanatory note and the degree of adherence to the work schedule, weighted score – 60 (R_c).

The criteria for evaluating the components of the explanatory note are given in the table

No. Stage	Components of the work	Maximum number of points for timely completion	Consideration of timeliness of completion
1	Title page design	2	100% of the grade if the work schedule is followed
2	Availability of the assignment on the CR	2	
3	Presence of content	2	
4	Presence and content of introduction	2	90% in case of delay up to 2 weeks
5	Presence and validity of the Antenna-1 design	5	
6	Presence and validity of design Antenna-2	5	80% in case of delay of more than 2 weeks
7	Presence and validity of the design Antenna-3	5	
8	Availability of calculations of basic parameters Antenna-1	10	
9	Availability of calculations of basic parameters Antenna-2	10	
10	Availability of calculations of basic parameters Antenna-3	10	
11	Availability and content of conclusions	5	
12	Availability and formatting of the list of sources	2	
	Total	60	

A student is admitted to the defense of a term paper if he/she has a starting component R_c of at least 60% of the maximum value, which is $60 \times 0.6 = 36$ points.

Quality of defense, weighted score – 40 (R_3).

Criteria for evaluating the presentation of the report based on the course work materials and answers to questions:

- the degree of mastery of theoretical material on the principles of antenna operation and the main dependencies of parameters up to 20 points;
- the degree of mastery of methods for designing and analyzing antennas and antenna systems as a whole up to 20 points.

The defense of the course work is considered successful if R_3 is not less than 60% of its maximum value, i.e., $40 \times 0.6 = 24$ points.

After the defense of the term paper, R_k is determined, which is then converted into a grade on the university scale according to the table:

Table of correspondence between rating points and grades on the university scale

Semester or credit points	Credit grade
95–100	excellent
85–94	Very good
75–84	good
65–74	satisfactory
60–64	sufficient
less than 60	unsatisfactory
Admission requirements not met	not admitted

9. Additional information on the discipline (educational component)

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

Computers with the following minimum requirements: 32-bit (x86) or 64-bit (x64) processor with a clock speed of 1 GHz or faster; 1 gigabyte (GB) of RAM (for the 32-bit version) or 2 GB (for the 64-bit version); 16 GB (for the 32-bit version) or 20 GB (for the 64-bit version) of free hard disk space; A graphics device with DirectX 9 support and WDDM 1.0 or later driver.

Software

- SciLab (<https://www.scilab.org/>)

Inclusive learning

Inclusive learning is permitted.

Work program for the academic discipline (syllabus):

Compiled by: Associate Professor of the RED, Serhii Martyniuk.

Approved by: RED (Minutes No. 06/2025 dated 06/17/2025).

Approved by: REF Methodological Council (Minutes No. 06/2025 dated 26.06.2025).