Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Department of Applied Radio Electronics

[RE-342/K.R.] DESIGN OF INTELLIGENT RADIO ELECTRONIC SYSTEMS COMPONENTS. COURSEWORK

Work program of the academic discipline (Syllabus)

Details of the academic discipline

Level of higher education	First (bachelor's)
Field of knowledge	17 - Electronics, Automation, and Electronic Communications
Specialization	172 - Electronic Communications and Radio Engineering
Educational program	Intelligent technologies of radio electronics
Discipline status	Regulatory
Form of higher education	Full-time
Year of training, semester	3rd 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	https://schedule.kpi.ua
Language of instruction	Ukrainian Information
about course coordinator/teachers	
Course location	

Course program

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

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 05 Ability to communicate in the official language, both orally and in writing

GC 07 Ability to learn and acquire 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 a modern information society.

PC 02 Ability to solve standard tasks of professional activity based on information and bibliographic culture using information and communication technologies and taking into account the basic requirements of information security

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

PC 08 Willingness to promote the implementation of promising technologies and standards

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

PC 18 Ability to assess the place and advantages of introducing elements of intelligent technologies and intelligent radio electronics into various fields of human activity

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

PC 22 Ability to select and critically evaluate and choose technical solutions at all stages of

development and design of radio-electronic equipment using intelligent technologies

PC 23 Ability to select and apply specialized software tools for simulation modeling and design of radio-electronic equipment

PC 25 Ability to reasonably select CAD for analysis, calculation, and optimization of the output characteristics of mathematical and circuit models of analog and digital devices depending on the frequency range, taking into account external factors, use Internet information resources to obtain mathematical and design models of radio components from manufacturers based on an assessment of the characteristics of information transmission in radio networks

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 PRN 06 Adapt to changes in information and communication network technologies, telecommunications and radio engineering systems

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

PLO 15 Apply understanding of the means of automation of design and technical operation of telecommunications and radio engineering systems in professional activities.

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

PLO 17 Understanding and compliance with domestic and international regulatory documents on the development, implementation, and technical operation of information and telecommunications networks, telecommunications and radio engineering systems.

PLO 18 Finding, evaluating, and using information from various sources necessary for solving professional tasks, including reproducing information through electronic search.

PLO 23 Select and apply technical solutions and perform the necessary calculations for the implementation of digital and analog signal processing methods.

PLO 24 Implement digital signal processing methods at the software and hardware levels.

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 31 Apply the basics of designing radio-electronic equipment for intelligent systems and the latest component base and materials when designing radio-electronic equipment for intelligent systems.

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

Prerequisites for the educational program:

Circuitry

Design of elements of intelligent radio-electronic systems Post-requisites for the

educational program:

Design of elements of intelligent radio-electronic systems

3. *Course content*

A typical task is to develop a circuit for analog-to-digital conversion of a continuous signal with specified parameters, consisting of an active filter, an analog-to-digital converter, a reference voltage source, and other typical components of radio-electronic devices.

At the student's request and with the consent of the instructor, another functional unit may be designed.

4. *Learning materials and resources*

1. U. Tietze, Ch. Schenk The semiconductor circuit design (set of 2 books). Volume 1., Book on Demand Ltd., 2018. – 830 p.
2. B. Carter, R. Mancini Op Amps for Everyone 5th Edition ., Newnes; 5th edition, 2017. – 484 p.
3. P. Horowitz, W. Hill The Art of Electronics 3rd Edition., Cambridge University Press; 3rd edition, 2015. – 1020 p.
4. Sedov S.O. Analog Signal Processing. Circuitry. Calculations: Textbook – Kyiv: Igor Sikorsky KPI, Polytechnica Publishing House, 2018. – 298 p.

1. Analog Electronics Tutorial
https://www.analog.com/en/education/education-library/tutorials/analog-electronics.html

2. Mixed Signal Electronics Systems Tutorial
https://www.analog.com/en/education/education-library/tutorials/mixed-signal-electronics-systems.html

3. Filter Design Tutorial
https://www.analog.com/en/education/education-library/tutorials/signals-and-systems.html

Educational content

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

...Information for mastering the component should be provided to students during lectures, computer workshops, and laboratory work.

6. *Independent work by students*

The main stages of work on developing the diagram are carried out independently by the applicants, in consultation with the teacher, namely:
1. Introduction
2. Selection of an analog-to-digital converter.
3. Selection and calculation of reference voltage source circuit elements.
4. Calculation of the active filter.
5. Simulation of the circuit operation.

6. Conclusions
7. List of references.
8. Appendices (Electrical schematic diagram)

Policy and control

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

Both the instructor and the student are required to adhere to the Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute." Key policy provisions:

- coursework must be completed independently
- the topic of the term paper may be consistent with the topic of the future bachelor's thesis; • the sections of the course paper must be completed in accordance with the established work schedule;
- Students have the right to appeal the results of the current control of the progress of the coursework, providing a reasoned explanation of which criteria they disagree with in accordance with the assessment sheet and/or comments.
- in case of academic misconduct, the work will not be accepted;
- Late completion of a section of the coursework will result in a 10% reduction in the score if the delay is no more than three weeks, and a 20% reduction if the delay is more than three weeks.

8. *Types of control and the learning outcomes assessment rating system (LOAS)*

Ongoing assessment

Ongoing assessment of coursework is carried out by checking sections of the

coursework. Calendar control

Calendar control is carried out twice per semester as monitoring of the current status of fulfillment of the syllabus requirements. Conditions for positive calendar control:

- Based on the results of academic work at the first calendar checkpoint (week 8), the student receives a "certified" grade if their current rating is at least 50% of the maximum possible number of points that the student could have received for the first 7 weeks.
- Based on the results of academic work at the second calendar check (14th week), the student receives a "certified" grade if their current rating is not less than 50% of the maximum possible number of points that the student could have received for the first 13 weeks.

Rating (weighted) point system and assessment criteria

The student's rating for the coursework consists of two components:

- assessment of the completed assignment - characterizes the student's work during the preparation of the coursework and its result;
- assessment of the defense of the work (presentation of the completed work, answers to questions).

Assessment of the completion of the assigned task

The degree of justification of the chosen solutions at all stages of the coursework is assessed; the quality of the engineering and circuit solutions adopted; the quality of the explanatory note and adherence to the work schedule. The maximum score is 80.

Students are allowed to defend their coursework provided that they have completed all the assigned tasks.

Assessment of the defense

The maximum weight score is 20. The defense of the term paper takes place before the members of the commission. At the defense, the student gives a presentation based on the materials of the term paper and answers questions.

Criteria for evaluating the presentation based on the coursework materials and answers to

questions: • free command of the material, completeness of the analysis of possible

options for completing the
task; quality of the presentation of results during the defense; ability to defend one's opinion – 20 points;

- high level of mastery of the material, inaccuracies in answers to questions; quality of presentation of results during defense; ability to defend one's opinion – 10-19 points;
- incomplete mastery of the material, incomplete analysis of possible options; insufficient quality of presentation of results during defense; inability to defend one's opinion – 9÷0 points.

Table of correspondence between rating points and university scale grades

Number of points	*Grade*
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)*

LTspice design environment

https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html

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

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Work program for the academic discipline (syllabus):
Compiled by V. O. Adamenko;
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)