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

Radioengineering Faculty
Radioengineering Department

Bachelor Thesis (PN 02)

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	*Information and communication radioengineering*
Status of discipline	*Compulsory for professional training*
Form of study	*Full-time and part-time* *Full-time accelerated and part-time accelerated*
Year of training, semester	*4th year, 8th semester (full-time, part-time)* *3rd year, 6th semester (full-time accelerated and part-time accelerated)*
Scope of the discipline	*Total: 6 ECTS credits / 180 hours* *Self-study by students: 180 hours.*
Semester control/control measures	*Defense of thesis project (work)*
Class schedule	*According to the plan agreed with the supervisor*
Language of instruction	*Ukrainian*
Information about the course director/lecturers	*Ph.D., Associate Professor, Radioengineering Department* *Serhii Martyniuk (Martyniuk.Sergii@LLL.kpi.ua),* *+38 066 298 37 00*
Course location	*The course is hosted on the Sikorsky distance learning platform:*

Curriculum

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

Bachelor thesis takes the form of a bachelor's diploma project or bachelor's thesis.

A **bachelor's thesis project (BTP)** is a type of certification work for applicants for a bachelor's degree, designed to objectively assess the degree of development of skills to solve typical tasks that are mainly

classified in higher education standards as project (design and engineering) and engineering production functions.

A thesis project is a completed engineering design of a project object (system, device, technological process, computer program, etc.) and involves the synthesis of a project object that meets the requirements of the thesis project assignment; with a detailed development of a specific functional part (element, node, subsystem, technological operation, etc.) taking into account the current level of development of the relevant industry, achievements in science and technology, economic, environmental, operational, and ergonomic requirements.

The BTP should be devoted to solving a topical scientific, technical, innovative, or production problem related to the development of software, software-hardware, or hardware.

The result of the BTP is a developed hardware, software-hardware, software product or its individual components: software-hardware module, device, unit, system, etc.

A **bachelor's thesis (BT)** is a type of certification work for applicants for a bachelor's degree, designed to objectively assess the degree of development of skills to solve typical tasks that are mainly classified in higher education standards as organizational, managerial, and executive (technological, operational) production functions.

The thesis involves the systematization, consolidation, and expansion of theoretical and practical knowledge in the specialty and its application in solving specific scientific, technical, economic, production, and other tasks, the development of self-study experience, and the mastery of methods for modeling and researching processes, objects, and systems in a specific field of science, technology, or economics.

The thesis should be devoted to solving a topical scientific, scientific-technical, or production problem related to the analysis, modeling, and research of processes, objects, and systems. In the process of performing the BT, software, software-hardware, or hardware may be developed that is necessary to obtain the characteristics of the studied process, object, or system, to verify the proposed hypothesis, to test the proposed model, etc.

The result of the BT is a theoretical exposition and practical recommendations for solving the task at hand.

In accordance with the professional educational program (PEP) of the first "bachelor's" level of higher education, the implementation of BTP/BT contributes to the formation of the following program **competencies** in students:

General competencies (GC)

GC02 – Ability to apply knowledge in practical situations.

GC03 – Ability to plan and manage time.

GC04 – Knowledge and understanding of the subject area and understanding of professional activity.

GC08 – Ability to identify, pose, and solve problems.

Professional competencies (PC)

PC02 – 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.

PC03 – Ability to use basic methods, means, and tools for obtaining, transmitting, processing, and storing information.

PC04 – Ability to perform computer modeling of devices, systems, and processes using universal application software packages.

PC08 – Willingness to promote the implementation of promising technologies and standards.

PC11 – Ability to compile regulatory documentation (instructions) for the operational and technical maintenance of information and telecommunications networks, telecommunications and radio engineering systems, as well as test programs.

PC14 – 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.

PC15 – Ability to perform calculations in the process of designing structures and means of information and telecommunications networks, telecommunications and radio engineering systems, in accordance with technical specifications using both standard and independently developed methods, techniques, and software tools for design automation.

PC16 – Ability to calculate the main 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 study the characteristics and devices of microwave antennas of various designs and frequency ranges.

PC17 – Ability to apply modern CAD systems for the design, structural synthesis, and highly efficient multi-parameter optimization of antennas, active and passive microwave devices.

PC18 – Ability to analyze, evaluate characteristics, and design modern low-noise microwave receivers for information and communication systems.

PC19 – Ability to apply and analyze various types of signal modulation and coding in radio communication channels of modern information and communication radio frequency systems.

PC20 – Ability to select random signal parameters and optimize the communication channel according to the required criteria in the presence of noise and interference, perform engineering calculations of the main characteristics of random signals and devices for their processing.

PC21 – Ability to design radio frequency printed circuit boards and microwave module structures.

PC22 – Ability to analyze the architecture, calculate parameters, and formulate requirements for the components of modern 4G mobile information and communication systems.

Program learning results (PLR)

According to the first "bachelor's" level of higher education, as a result of completing the BTP/BT, students must demonstrate the following **program learning results**:

PLR01 – Analyze, argue, and make decisions when solving specialized tasks and practical problems in telecommunications and radio engineering, which are characterized by complexity and incomplete certainty of conditions.

PLR02 – 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.

PLR04 – Explain the results obtained from measurements in terms of their significance and relate them to the relevant theory.

PLR14 – Apply the basic properties of the component base to ensure the quality and reliability of telecommunications and radio engineering systems and devices.

PLR15 – Apply means of automation of design and technical operation of telecommunications and radio engineering systems in professional activities.

PLR17 – Understand and comply with domestic and international regulatory documents on the development, implementation, and technical operation of information and telecommunications networks, telecommunications, and radio engineering systems.

PLR18 – Find, evaluate, and use information from various sources necessary for solving professional tasks, including reproducing information through electronic search.

PLR24 – Perform calculations, numerical optimization, and design of antennas and microwave devices, active microwave receiving systems using modern CAD systems.

PLR25 – Calculate and design low-noise receivers for information and communication radio systems.

PLR26 – Perform calculations for decision-making and calculate the parameters of random signals when constructing an information and communication radio engineering system that works with random signals.

PLR27 – Select modulation parameters and apply methods of noise-resistant and efficient coding of information and communication radio systems.

PLR28 – Perform engineering assessments and make recommendations to ensure the electromagnetic compatibility of multiple microwave systems.

PLR29 – Measure the basic parameters of antennas, microwave devices, and active microwave reception systems.

PLR30 – Use Internet technologies to deploy computer communication networks for information radio systems.

PLR31 – Know and be able to use the main means of protection and defense of the state, compatriots, material values, and territorial integrity of the state, in particular, in the event of military actions and emergencies.

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

In the structural-logical scheme of the professional educational program for training specialists of the first (bachelor's) level of higher education, the academic discipline "Bachelor thesis" is included in the list of compulsory professional disciplines aimed at forming the professional competencies of a specialist.

Prerequisites – the academic discipline is specialized in nature and is completed by students in the 8th semester of the 4th year of study in first (bachelor's) level higher education programs. Knowledge of all professional disciplines is required to successfully complete this discipline.

Post-requisites – the knowledge gained in this discipline will allow students to assess their own level of technical training when seeking future employment.

It is an integral part of the first (bachelor's) level of higher education.

3. Course content

The content of the course "Bachelor thesis" consists of self-study by the student, during which he or she independently completes a project/assignment in accordance with a plan approved by the supervisor. All tasks, assignments, and their completion are agreed upon with the supervisor and carried out under his or her supervision. 180 hours are allocated for self-study within the framework of the discipline "Bachelor thesis". The stages of self-study of the student during the completion of the certification work are shown in the table

Depending on the task of the qualification work, the topics assigned for self-study may be adjusted and modified by the project (work) supervisor.

Stages of work on the diploma project/work

No.	Title of the topic assigned for self-study	Number of hours
1	Review and analysis of existing solutions related to the topic of the thesis project. Analysis of the necessary scientific and technical documentation	1
2	Description of the subject environment	10
3	Definition of the subject and tasks of the thesis design	5
4	Determination of input and output data	5
5	Determination of methods and means for solving thesis design problems	15
6	Analysis of possible options for completing the task	15
7	Development of a structural diagram of the device. Description of the research structure	10
8	Development of schematic diagrams of nodes and the device as a whole	20
9	Selection of components for device implementation	10
10	Software design (if necessary)	10
11	Device design (printed circuit board, structure, and parts)	20
12	Performing the necessary calculations to confirm the device's operability	15
13	Creating graphic materials for the thesis project	10
14	Writing and formatting an explanatory note for a thesis project/work	10
15	Preparing a presentation	5
16	Preparation for defense	5

4. Teaching materials and resources

Literature

1. Regulations on the organization of the educational process at Igor Sikorsky KPI. URI: https://kpi.ua/regulations.
2. Regulations on the final certification of students at Igor Sikorsky Kyiv Polytechnic Institute. URI: https://kpi.ua/files/n7437.pdf.
3. Bachelor's qualification work. Recommendations for completion, formatting, and defense [Electronic resource]: textbook for bachelor's degree candidates in the educational program "Radio Engineering Computerized Systems" in the specialty 172 Telecommunications and Radio Engineering / Igor Sikorsky Kyiv Polytechnic Institute; compiled by V. O. Piddubny. – Electronic text data (1 file: 537.36 KB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2023. – 29 p. – Title from the screen.

Policy and control

5. Policy of the academic discipline (educational component)

Rules for performing work

The process of performing qualification work consists of the following stages:

– preparatory, which includes choosing a topic and receiving an individual assignment from the supervisor on issues to be addressed during the pre-diploma internship on the chosen topic

(familiarization with the state of the problem, selection of necessary materials, conducting observations, experiments, research, etc.). Completion of the pre-diploma internship program ends with the preparation and defense of a report on its completion (credit);

– main stage, which begins immediately after the defense of the practice report and ends approximately one week before the defense of the qualification work with the submission of the BTP or BT for preliminary defense. At this stage, the work must be completed, checked by the supervisor and, if any, consultants;

– final, which includes obtaining feedback from the supervisor and reviews. The completed qualification work with the supervisor's feedback is submitted by the applicant no later than a week before the day of the defense. The head of the department, based on the submitted materials and, if necessary, the results of an interview with the student, makes a decision on admission to the defense and puts a stamp on the title page of the student's qualification work.

Formatting of work materials

The thesis project (work) is completed in the form of an explanatory note (EN) of 50-70 A4 pages (text part of the thesis without appendices) and a graphic part (illustrative material). During the defense of the qualification work, demonstration materials may be used in graphic, electronic (video materials, multimedia, presentations, etc.) or physical (models, mock-ups, product samples, etc.) form, but only those that are an integral part of the qualification work.

Preparation for the defense of the thesis

For a successful defense, it is necessary to prepare a report in which you should present arguments, indicate what you have done personally, what guided you in researching the topic that is the subject of development or research, what methods were used in studying the problem, what new results were achieved in the course of the research, and what are the main conclusions of the work. The applicant must be well versed in their notes and be able to give a reasoned answer to the questions of the expert commission.

Announcement of the results of control measures

The defense of the completed BTP/BT takes the form of a presentation of the completed work to the expert commission, followed by a stage where the student defends the decisions they have made. During the defense, the student must be able to explain the results obtained and answer theoretical and practical questions on the topic of the work.

Academic integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute." For more details, see: https://kpi.ua/code.

Ethical standards

The standards of ethical conduct for students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute." For more information, visit: https://kpi.ua/code.

6. Types of control and rating system for assessing learning outcomes (RSA)

Plagiarism check

The text of the explanatory note is checked for similarities with existing works using special software. The result of the plagiarism check is a report generated by the software. The decision on the presence or absence of plagiarism is made by the person responsible and the supervisor of the work.

Review of the project/work

The quality of the explanatory note and graphic material is assessed by a reviewer. After reviewing the explanatory note of the submitted work, the reviewer prepares a review, indicating all the positive aspects of the work and comments. The result is a recommendation (or non-recommendation) to award the student a bachelor's degree and the recommended number of points.

Supervisor's review of the project/work

Upon completion of the BTP/BT, the supervisor writes a review of the work, in which they indicate their overall opinion of the work, as well as the student's work on it. The result is a recommendation (or non-recommendation) to award the student a bachelor's degree.

Preliminary defense of the project/work

Preliminary defense of the project/work is held 5–7 days before the date of the defense. This allows checking the availability of the necessary material, its composition and quality, which makes it possible to conclude whether the student is ready to defend their work before the examination committee (EC). The preliminary defense takes place in a form similar to the actual defense before the examination committee. This allows the student to check the quality of their report and presentation. The result is recommendations from teachers on how to improve the submitted and presented materials.

Assessment of the qualification work

The assessment of the qualification work is based on the assessment of the degree of competence of the applicant in accordance with the requirements of higher education standards (defense of the qualification work) and is carried out at an open meeting of the EC with the participation of at least half of its members and the mandatory presence of the chair of the commission. The meeting is also open to anyone who wishes to attend, ask questions, and discuss the work. The defense can be conducted remotely on the Zoom platform in real time.

The EC evaluates the defense of the qualification work according to the following criteria: the quality of the report and presentation, the degree of mastery of the material, the degree of justification of the decisions made, and the ability to defend one's opinion. Grades are given by each member of the EC individually on a 100-point scale.

The final grade is calculated as the average of the grades given by the members of the EC, the review grade, and additional points for the practical focus of the thesis. The final grade cannot exceed 100 points.

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

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

7. Additional information on the discipline (educational component)

Distance learning

Synchronous and asynchronous distance learning is possible using video conferencing platforms (Google Meet, Zoom, etc.) and the Sikorsky distance learning educational platform (Moodle).

Inclusive learning

Inclusive learning is permitted.

Work program for the academic discipline (syllabus):

Prepared 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).