MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE"

APPROVED

Academic Council Igor Sikorsky Kyiv Polytechnic Institute

(protocol No. 6, dated 17.09.2020 p.)

Head of Academic Council

_____ Mykhaylo ILCHENKO

TELECOMMUNICATIONS AND RADIO ENGINEERING

EDUCATIONAL AND SCIENTIFIC PROGRAM

The third (educational and scientific) level of high education

Specialty	**172 Telecommunications and Radio Engineering**
Field of knowledge	**17 Electronics and Telecommunications**
Educational qualification	**Philosophy Doctor in telecommunications and radio engineering**

Implemented by Order of Rector
of Igor Sikorsky KPI
date 17.09.2020_ No. 1/232_____

Kyiv – 2020

PREAMBLE

DEVELOPED by the project team:

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APPROVED BY

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Scientific and Methodological Commission of Igor Sikorsky KPI, speciality 172
Telecommunications and Radio Engineering
Head of SMC 172 _____ Leonid URYVSKY
(Protocol № 2, dated 01.09.2020)

Methodological Commission of Igor Sikorsky KPI
Head of Methodological Commission
_____ _____ Yurii YAKYMENKO
(protocol № 1, dated 03. 09.2020)

RELATED:

The work on the educational program was carried out by:

- The staff of the teaching and methodological department of the Igor Sikorsky KPI;
- Professionals in the related field of knowledge;
- High school graduates, who study in the educational-scientific program Telecommunication and Radio Engineering

The educational program was discussed after all requests and suggestions from the stakeholders have been received and approved at the extended meetings of

- department of Telecommunications (Protocol № 1 "28" August 2020),
- department of Telecommunications Systems (Protocol № 1 "28" August 2020),
- department of information and telecommunication networks (protocol No. 1 of August 28th , 2020),
- department of design of electronic-calculating apparatus (protocol No. 8 August 31th , 2020),
- department of Theoretical Foundations of Radio Engineering (protocol No. 8 August 31th , 2020),
- department of Radioreception and Signal Processing (protocol № 8 August 28th , 2020),
- department of Design and manufacturing of radio equipment (protocol No. 8, August 27th , 2020),
- department of Radio Engineering Devices and Systems (protocol No. 10 "26" August 2020).

Stakeholder reviews are added.

Institutions and organizations that gave feedback on the educational program:

- Radionix" LLP, "Lyleya" LLP, Kontsern RRT, JV Institute of Electronics and Communications of UAS, State company "UCRF".

Higher education graduates, who were involved in the development of the educational program: Anatoly OMELYAN (Ph.D. student, DK-71f group), Leonid VERES (Ph.D. student, TK-71f group), Larion ROMAN (Ph.D. student, PC-91f group), Radomir DYACHENKO (Ph.D. student. RL-81f group)

CONTENT

1. PROFILE OF THE EDUCATIONAL PROGRAM

SPECIALTY 172 TELECOMMUNICATIONS AND RADIO ENGINEERING

1 – Загальна інформація	
Full name of University and faculty/institute	National technical university of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Institute of Telecommunication Systems, Radio engineering Faculty, Faculty of Electronics
Higher education degree and title of qualification in the original	Degree – Doctor of Philosophy Educational qualification – Doctor of Philosophy in Telecommunications and Radio Engineering
Official name of educational program	Telecommunications and Radio Engineering
Type of diploma and volume of educational program	Doctor of Philosophy degree, 40 ECTS credits, study period 4 years The scientific part involves performing of own scientific research and preparing the results in the form of a dissertation.
Accreditation	The program is not accredited, the program will be submitted for accreditation to the National Agency for Higher Education Quality in 2021-2022 academic year
Level from National frame of qualifications (NFQ)	NFQ of Ukraine - level 9 (QF-EHEA - third cycle, EQF-LLL - level 8)
Prerequisites	Master's degree
Language	Ukrainian/English
Validity of educational program	Until the next accreditation
Link of permanent storage of educational program	http://www.its.kpi.ua (page: "Admission" – "PhD.") http://www.fel.kpi.ua (page: "Admission") http://www.rtf.kpi.ua (page: "For applicants") https://osvita.kpi.ua/ (page "Education programs").

2 – Мета освітньої-наукової програми

The goal of the educational program is to train highly qualified, competitive, integrated into the European and world scientific and educational community scientists with the degree of Doctor of Philosophy in the field of electronics and telecommunications, The main purpose of the program is to develop the ability to independently solve complex problems in the field of professional and / or research and innovation activities, which requires the implementation of intercultural interaction with representatives of academic and scientific-technological communities under the following conditions:

- scientific and technological progress and the constant evolution of society;
- Internationalization of education;
- Transformation of the labor market through interaction with stakeholders;
- comprehensive professional, intellectual, social and creative development of the individual in the educational and scientific environment.

3 – Characteristics of educational program	
Subject Category	***Objects of study and activity***: processes of research, design, modernization, implementation and operation of modern telecommunications and radio engineering systems, complexes, technologies, devices and their components. ***Purposes of study***: Training of telecommunications and radio engineering professionals to form general and specialized (practical, subject) competencies necessary for innovative scientific and research activities in research, design, modernization, implementation and operation of modern telecommunication and radio engineering systems, complexes, technologies, devices and their components. ***Theoretical content includes***: terms, categories, concepts, principles, standards, models and methods of building and functioning of telecommunication and radio engineering systems, complexes, technologies, devices and their components. ***Methods, techniques, approaches and technologies***: research, design, modernization, implementation and operation of modern and advanced telecommunication and radio engineering systems, complexes, technologies, devices and their components. ***Instruments and equipment***: new software, hardware and software/hardware tools used in professional activities for research, design, modernization, implementation and operation of modern telecommunications and radio engineering systems, complexes, technologies, devices and their components.
Orientation of educational program	Educational and scientific.
Main focus of educational program and specialization	Specialized education, in the field of electronics and telecommunications, specialties telecommunications and radio engineering. Emphasis on the implementation of innovative methods and technologies in the process of creation and use of telecommunications and radio equipment. Key words: telecommunications, programming, infocommunications technologies, immitation modelling, radio technology, electronics, innovations, system analysis.
Features of the program	The feature of the program is that the presented ESP was created on the basis of the analysis of previously existing in the units of ES ITS, RTF and FEL relevant programs. So it is natural that their best practices have been taken into account. Another feature of the developed ESP is taking into account the wishes to build a structural and logical scheme and content of disciplines by employers, leading research institutions, institutions of higher education, which are planned for further employment of graduate students. The experience of leading foreign universities that train doctors of philosophy in related specialties is also taken into account.
4 – Suitability of graduates for employment and further study	
Suitability for employment	According to the National Classifier of professions of Ukraine: DK 003: 2010: 2144 Professional in the field of electronics and telecommunications 2144.1 Research assistant (electronics, telecommunications) 2310 Lecturer in the university 2310.1 Doctorant 2310.1 Associate professor
Further study	To continue education at the doctoral and /or participation in postdoc programs.

5 – Teaching and Assessment	
Teaching and studying	Problem-oriented training to acquire competencies sufficient for coming up of new ideas, solving complex problems in the professional sphere and self-development of in-depth knowledge, which includes: lectures, laboratory, practical and seminars, technology mixed learning and dual education, independent work using scientific and informational-literary sources, consultations with teachers, work on their own scientific research, the passage of educational practice. The training ends with the writing and submission of the thesis
Assessment	All types of educational activities and control measures (oral and written tests, exams, testing, etc.) are evaluated according to the rating system on a 100-point scale, followed by translation into grades on a university scale.
6 – Program Competencies	
Integral competence	Competence to solve complex problems in the field of professional and/ or research and innovation activities, which requires a profound reinterpretation of existing and creation of new core knowledge and/ or professional practice.
General Competencies (GC)	
GC 1	Ability to critically analyze, evaluate and synthesize new complex ideas
GC 2	Ability to initiate, develop and implement research and innovation projects including own research
GC 3	Ability of critical thinking and solving the problems of scientific and research of innovation spheres; widening the limits and reinterpretation of available theoretical knowledge and professional practice
GC 4	Ability of self-development and self-education in the course of life
GC 5	Ability to perceive, develop, use and adapt the basic research process with scientific completeness and consistency in a context that extends the limits of knowledge
GC 6	Ability of interactive communication with the broader scientific community and the public in the field of scientific and/or professional activities.
GC 7	Ability to contribute to technological, social and cultural progress in academic and professional contexts.
GC 8	Ability to communicate in a foreign language.
GC 9	Ability to search, process and analyze information from different sources
GC 10	Ability to work in an international context
Special professional competencies (SC)	
SC 1	Ability to adapt and summarize the results of modern research for solving scientific and practical problems
SC 2	Ability to apply mathematical methods of scientific research, simulation modeling, applied aspects of systems analysis in various kinds of professional
SC 3	Ability to perform theoretical and experimental research, mathematical and computer modeling of processes in telecommunications and radio engineering systems and devices.
SC 4	Ability to implement modern information technologies, equipment and methods of research, communications, and to increase energy and economic efficiency in the design, production and operation of telecommunication and radio engineering systems and devices.
SC 5	Ability to organize, provide and control the maintenance of scientific and professional qualification of the staff at the world level of scientific and engineering achievements in the field of development and exploitation of telecommunications and radio engineering systems and devices.
SC 6	Ability to use new educational technologies, including information technologies and dual forms of education, visualization tools in the teaching process.

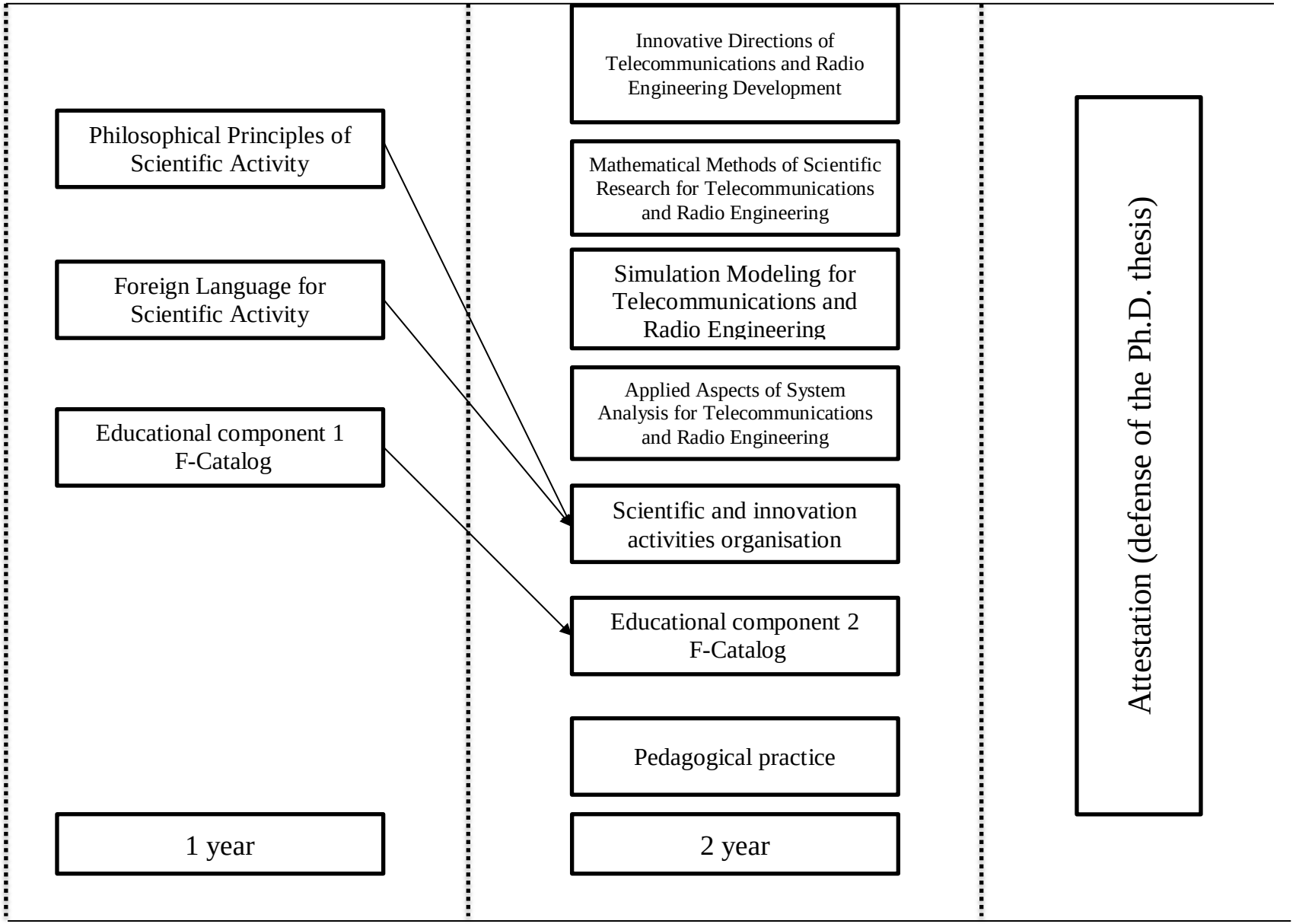
SC 7	Ability to prepare educational proposals and implement the educational process for the Ukrainian and other home audiences, to refine teaching methods for a better understanding of the subject.
SC 8	Ability to commit the research ethics as well as the rules of academic integrity in scientific research and scientific and pedagogical activities.
SC 9	Ability to carry out scientific and pedagogical activities in higher education using new pedagogical approaches and practices, including information technology, multimedia tools in the educational process for Ukrainian and other domestic audiences, improving teaching methods for a better understanding of the subject.
7 – Program results of teaching (PRT)	
KNOWLEDGE	
KN 1	Conceptual and methodological knowledge in the field of research and / or professional activity and between the subject fields
KN 2	Knowledge of methods of scientific research in the field
KN 3	Modern methods and technologies of scientific communication in Ukrainian and foreign languages
KN 4	Modern mathematical methods of scientific research, simulation modeling, applied aspects of systems analysis
KN 5	Research methods of mathematical models and algorithms of data base control systems, distributed and web-based systems, integrated telecommunication networks, radio and video systems, information processing systems.
KN 6	Peculiarities of philosophical and ideological conditions, modern tendencies, directions and regularities of development of Ukrainian science in the conditions of globalization and internationalization.
SKILLS	
SK 1	To use innovative approaches in solving problems and tasks, to show autonomy, scientific and professionalism
SK 2	Generate and develop new ideas or processes in a cutting-edge field of specific teaching and professional activities, including research
SK 3	Reconsider existing and create new holistic knowledge and/or professional practice and solve significant social, scientific, cultural, ethical, and other problems.
SK 4	To plan and organize the work of research groups in solving scientific and educational tasks and implementation of projects, including their own research
SK 5	Carry out independently the scientific and research work in the telecommunications and radio engineering fields using modern mathematical methods of scientific research, simulation modeling, and applied aspects of systems analysis.
SK 6	To carry out research and innovation activities of scientific teams by initiating international scientific cooperation and academic mobility, and writing research papers, preparation of scientific reports, validation and implementation of the results of research and development, dissemination of information about the results of research at international conferences, seminars, etc.
SK 7	Plan, organize the work and lead projects in the field of scientific research, development, analysis, calculation, modeling, manufacturing and testing of telecommunications and radio engineering systems and devices.
SK 8	Organize and manage the research, innovation and investment activities, business projects and production processes with regard to technological indicators, market requirements, existing standards, and the competitiveness of scientific and engineering products
SK 9	Develop and carry out all kinds of classes at institutions of higher or other education, including the integration of studying at the workplace of enterprises, institutions and organizations (using dual education technology)
SK 10	Create a complete methodological and didactic support for the professional and basic training of teachers at all levels of higher education, adapt the material available in

	accordance with scientific and technological progress, the special features of teaching, the current norms and standards
SK 11	To provide and analyze the choice of a specific type of model and method of telecommunication and radio engineering systems when solving relevant practical tasks
SK 12	Choose the appropriate (the best for certain criteria) method of solving the problem.
SK-13	Demonstrate the skills of professional communication, including oral and written communication in one of the widespread European languages
8 – Resource support for program implementation	
Staff	In accordance with the personnel requirements to ensure the implementation of educational activities for the relevant level of HE (Annex 2 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05. 2018
Equipment	In accordance with the technological requirements for logistics of educational activities of the appropriate level of HE (Annex 4 to the License Terms), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 dated 10.05 .2018 p. Use of equipment for lectures in presentation format, measurement technology, especially on the Sikorsky distance learning platform, demonstration equipment in the course of laboratory workshops
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the relevant level of HE (Annex 5 to the License Conditions), approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 1187 as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine №347 from 10.05.2018. Use of the Scientific and Technical Library of the Igor Sikorsky KPI
9 – Academic mobility	
National credit mobility	Possibility to conclude agreements on academic mobility and a double diploma with other Ukrainian universities
International credit mobility	The content of the program meets world educational standards, which allows someone to take part in dual degree programs and be competitive in the global job market. Cooperation agreement between Igor Sikorsky KPI and the Technical University of Dresden (Germany) for the Erasmus+ program (ICM). Dual Diploma Program between Igor Sikorsky KPI and the Centrale Supélec University (France). Program of the Subsidiary Diploma between Igor Sikorsky KPI and the TU of Chemnitz (Germany). Program of the Subsidiary Diploma between Igor Sikorsky KPI and the Korean Institute of Science and Technology (KIST, Korea)
Studying of foreign applicants for higher education	Training of foreign applicants for higher education, who studying ESP for programs of international academic mobility, can be conducted in English or Ukrainian, provided that the applicant has a language of instruction at a level not lower than B2.

2. LIST OF EDUCATIONAL PROGRAM COMPONENTS

Code of subject	Components of the educational program (academic disciplines, course projects (works), internships, qualification work)	Number of credits	Form of final control/exam
1	2	3	4
1. NORMATIVE COMPONENTS			
Academic disciplines for general scientific (philosophical) competencies			
D1	Philosophical Principles of Scientific Activity	6	exam
Educational disciplines for achieving language competencies			
D2	Foreign Language for Scientific Activity	6	exam
Academic disciplines for acquiring in-depth knowledge of the specialty			
D3	Innovative Directions in Telecommunications and Radio Engineering Development	3	exam
D4	Mathematical Methods of Scientific Research for Telecommunications and Radio Engineering	3	exam
D5	Simulation Modeling for Telecommunications and Radio Engineering	3	exam
D6	Applied Aspects of System Analysis for Telecommunications and Radio Engineering	3	exam
Studying disciplines for the achievement of universal competences of the researcher			
D7	Scientific and innovation activities organisation	4	Pass/not pass
D8	Pedagogical practice	2	Pass / not pass
2. Optional educational components			
Studying disciplines for the achievement of universal competences of the researcher			
U1	Educational component 1 F-Catalog	5	exam
U2	Educational component 2 F-Catalog	5	exam
The total amount of components of general disciplines:		30	
The total amount of optional components:		10	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		40	

3. STRUCTURAL AND LOGICAL DIAGRAM OF THE EDUCATIONAL PROGRAM



4. SCIENTIFIC COMPONENT

Year of training	Content of scientific training	Form of control
1 year	"Choice and substantiation of the topic of own scientific research, determination of the content, terms of performance and volume of scientific works; selection and substantiation of the methodology of conducting own research, review and analysis of existing views and approaches that have developed in modern science in the chosen field. Preparation and publication of at least 1 article (usually a review) in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Approval of the individual plan of the graduate student's work at the academic council of the institute / faculty, reporting on the progress of the individual graduate student's plan twice a year
2 year	Conducting own research under the guidance of the supervisor, which involves solving research problems through the use of a set of theoretical and empirical methods. Preparation and publication of at least 1 article in scientific professional publications (domestic or foreign) on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	reporting on the progress of the individual graduate student's plan twice a year
3 year	Analysis and generalization of the obtained results of own scientific research; substantiation of scientific novelty of the obtained results, their theoretical and / or practical significance. Preparation and publication of at least the 1st article in scientific professional publications on the research topic; participation in scientific and practical conferences (seminars) with the publication of abstracts.	reporting on the progress of the individual graduate student's plan twice a year
4 year	Registration of scientific achievements of the post-graduate student in the form of the dissertation, summing up concerning completeness of coverage of results of the dissertation in scientific articles according to the	Report on the progress of individual plan of the graduate student

	current requirements. Implementation of the obtained results and receipt of supporting documents. Submission of documents for preliminary examination of the dissertation. Preparation of a scientific report for final certification (defense of the dissertation).	Giving a report on the scientific novelty, theoretical and practical significance of the results of the dissertation

5. FORM OF GRADUATION CERTIFICATION OF HIGHER EDUCATION GRADUATES

The graduation examinations for the graduates of the higher education program "Telecommunications and Radio Engineering" specialty 172 Telecommunications and Radio Engineering is carried out in the form of a thesis defense and is completed with the award of a document of the established form for the degree of doctor of philosophy with the award of the degree of qualification: Doctor of Philosophy in Telecommunications and Radio Engineering. Dissertation work is reviewed for plagiarism and after protection is placed in the repository of the NTB University for free access. Graduation test is carried out openly and publically.

6. MATRIX OF CORRESPONDENCE BETWEEN PROGRAM COMPETENCES AND COMPONENTS OF EDUCATIONAL PROGRAM

	D1	D2	D3	D4	D5	D6	D7	D8	Scientific component
GC 1				+	+	+			
GC 2			+	+					+
GC 3			+			+			+
GC 4	+								
GC 5			+			+	+		+
GC 6		+							
GC 7								+	
GC 8		+							
GC 9	+						+		+
GC10		+							
SC 1	+		+			+			+
SC 2				+	+	+			
SC 3			+	+	+	+			
SC 4			+			+			+
SC 5		+							
SC 6								+	
SC 7		+						+	
SC 8							+		+
SC 9								+	

7. MATRIX OF CORRESPONDENCE BETWEEN PROGRAM EDUCATIONAL RESULTS AND RESPECTIVE COMPONENTS OF EDUCATIONAL PROGRAM

	H1	H2	H3	H4	H5	H6	H7	H8	**Наукова складова**
KN 1	+		+	+		+	+		+
KN 2				+		+	+	+	
KN 3		+							
KN 4			+	+	+	+			+
KN 5									+
KN 6	+								
SK 1			+				+		+
SK 2	+								
SK 3	+								
SK 4							+		
SK 5				+	+	+			+
SK 6		+							
SK 7				+	+		+		
SK 8							+		+
SK 9								+	
SK 10								+	
SK 11					+				+
SK 12			+	+		+			+
SK 13		+							