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

APPROVED
by Academic Council of
Igor Sikorsky Kyiv Polytechnic Institute
protocol No. 6 dated September 7, 2020

Chairman of the Academic Council
Mykhailo ILCHENKO

EDUCATIONAL AND SCIENTIFIC PROGRAM
Ecology

Ecology

third level of higher education

Program Subject Area	**101 Ecology**
Field of Study	**10 Natural Sciences**
Educational qualification	**Doctor of Philosophy in Ecology**

Came into force by the Rector's Order of
Igor Sikorsky Kyiv Polytechnic Institute
dated September 17, 2020 № 1/282

Kyiv - 2020

PREAMBLE

DEVELOPED by the project team:

Project team leader:
Gomelya Mykola Dmytrovych, Doctor of Technical Sciences, Professor, Head of the Department of Ecology and Plant Polymers Technology

Project team members:
Shabliy Tetyana Oleksandrivna, Doctor of Technical Sciences, Professor, Professor of the Department of Ecology and Plant Polymers Technology

Radovenchyk Vyacheslav Mykhailovych, Doctor of Technical Sciences, Professor, Professor of the Department of Ecology and Plant Polymers Technology

Head of the Department of Ecology and Plant Polymers Technology
Gomelya Mykola Dmytrovych, Doctor of Technical Sciences, Professor

AGREED:

Scientific and Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute for program subject area 101 Ecology

Head of the SMB-101 Mykola GOMELYA
(protocol No. 1 dated September 3, 2020)

Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute

Head of the Methodological Council Yuriy YAKYMENKO
(protocol No. 1 dated September 3, 2020)

CONSIDERED:
external approbation of EP (reviews are attached), proposals of stakeholders, graduates of EP and PhD-students are taken into account. EP was discussed after receiving all suggestions and approved at the council of the Department of Ecology and Plant Polymers Technology (protocol No. 2 dated September 3, 2020).

1. PROFILE OF THE EDUCATIONAL PROGRAM
in the Program Subject Area 101 Ecology

1 – General information	
Full name of HEI and institute / faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Faculty of Chemical Engineering
Higher education level and title of qualification in the original language	HE Degree - Doctor of Philosophy Qualification - Doctor of Philosophy in Environmental Studies
The official name of the educational program	Environmental Studies
Type of diploma and scope of educational program	Doctor of Philosophy. Normative training period 4 years. Educational component of 40 ECTS credits. The scientific component involves conducting own research and presenting of its results in the form of a dissertation.
Availability of accreditation	The program is accredited for the first time, National Agency for Quality Assurance in Higher Education, 2021.
Cycle / level of HE	NFQ of Ukraine - level 8 QF-EHEA - the third cycle EQF-LLL - level 8
Prerequisites	Master's degree
Language (s) of instruction	Ukrainian
Term of the educational program	Until the next accreditation
Internet address of the permanent placement of the educational program	*https://osvita.kpi.ua/*, section "Educational programs" *https://eco-paper.kpi.ua/*, section "Education" →"Educational programs"
2 – The goal of the educational program	
Training of a professional capable of solving complex problems and problems in the field of ecology and environmental safety, to carry out scientific-innovative activities, the results of which have scientific novelty, theoretical and practical significance; and, through a harmonious combination of general scientific knowledge, in-depth knowledge of the specialty and engineering tools, to successfully compete in the labor market in terms of sustainable innovative scientific technological development of society.	
3 – Characteristics of the educational program	
Subject area	Objects of study and activity are: structure, conditions of functioning and monitoring of environmental and geotechnical systems, components of modern technogenesis, fundamentals of environmental law, up-to-date environmental management, modernization of productions taking into account resource efficiency in the conditions of sustainable development, rational use of natural resources, resource management if the conditions of technogenesis, the latest technologies for protection of atmospheric air from pollution, modern technologies for water conditioning and water treatment, modern technologies for processing and disposal of waste of various origins, protection of the lithosphere and geological systems. Learning objectives are: training of scientists capable to

	comprehensively solve complex tasks and problems in the field of ecology and environmental safety, to develop new and improve existing systems of environmental protection and its components, that includes making research in conditions of not sufficient information and contradicting requirements. Theoretical content of the subject area: fundamental and applied research, analysis, design, innovative approaches to solving complex problems in the field of environmental protection on the basis of up-to-date requirements for environmental protection, sustainable use of natural resources and sustainable development. Methods, techniques and technologies: The applicant must master modern methods of collecting, processing and interpreting the results of environmental research, the methodology of scientific research. Tools and equipment: equipment, hardware and software needed for field, laboratory and remote sensing of natural and man-made systems, modeling of environmental conditions.
Orientation EP	Educational and Scientific
The main focus of the EP	Special education in the field of natural sciences, Program Subject Area in Ecology. Key words: biosphere, environmental systems, biocenosis, geotechnical systems, sustainable development, natural resources, anthropogenic load, resource conservation, environmental protection, clean technologies. The program is based on the latest scientific advances in the field of environmental protection and conservation, taking into account the current level of technology, focuses on current scientific issues, within which it is possible to continue in scientific career in environmental monitoring, environmental management, natural resources management, resource management in the conditions of technogenesis, development of perspective technologies for the reduction of anthropogenic load on environment.
Features of EP	The uniqueness of the program is based on a deep understanding of the state of environmental systems and the features of man-made impacts on them, the ability to update existing production to increase its productivity while significantly reducing harmful emissions, discharges, waste and levels of hazardous environmental impacts. Educational program focuses on current scientific problems, within which further scientific career is possible in the field of environmental monitoring, environmental management, rational use of natural resources in terms of technogenesis. The uniqueness of the program is emphasized by its educational and scientific components – by a combination of fundamental theoretical knowledge and practical skills in the field of identification of environmental problems and environmental decision-making; by formalization and quantitative substantiation of decisions for the subsequent use of the obtained knowledge in research, organizational, project work, by structuring and organization of scientific and innovative activity.

4 – Qualification of graduates for employment and further studying	
Qualification for employment	Doctor of Philosophy in Environmental Studies can carry out professional activities by type of economic activity "Research and development in the field of natural and technical sciences" (Classifier of economic activities code 73.10, ISIC code 731). Graduates can provide services in research and experimental development in the field of natural sciences, as well as consulting services for environmental protection (code ДК 016: 2010 72.19.19, 72.19.50, 74.90.13). Graduates can work in primary positions in the professions defined by the National Classification of Ukraine: Classifier of professions ДК 003: 2010 2211.2 Environmental engineer 2211.2 Environmental expert 2149.1 Researchers (other fields of engineering) 2149.1 Junior researcher (engineering) 2310 Teachers of universities and higher educational institutions
Further training	Continuing of education in doctoral studies and / or participation in postdoctoral programs
5 – Teaching and evaluation	
Teaching and learning	Learning through research, student-centered, personality-differentiated, problem-oriented, self-learning. All participants in the educational process are provided with timely and understandable information on the goals, content and program learning outcomes, the evaluation procedure and criteria within the individual educational components. Full preparation for research activities is provided through participation in research projects with the publication of results in scientific journals. Opportunities for present the results of scientific research are provided, in particular, through the annual International scientific-practical conferences "Ecology. Human. Society" and "Clean Water. Fundamental, applied and industrial aspects".
Evaluation	Current and semester control is carried out in accordance with the Rating System in the form of reports, tests and exams.
6 – Program competencies	
Integral competence	Ability to solve complex problems in the field of ecology, environmental safety, environmental protection, which involves a deep rethinking of existing and the creation of new integrated knowledge and/or professional practice.
General competences (ЗК)	
ЗК 1	Ability to critically analyze, evaluate and synthesize new and complex ideas
ЗК 2	Ability to abstract thinking, analysis, synthesis and evaluation of modern scientific achievements, generating new knowledge in solving research and practical problems
ЗК 3	Ability to develop and implement projects, including own research
ЗК 4	Ability to initiate research and innovation projects and work individually during their implementation
ЗК 5	Ability to work in an international context
ЗК 6	Ability to propose concepts, models, to invent and test methods and tools of professional activity using the base of natural, social-humanitarian and economic sciences
ЗК 7	Ability to use basic general knowledge of various sciences in professional activity
ЗК 8	Ability to adhere to moral and ethical rules of behavior, research ethics, characteristic of the participants of the academic environment, as well as the rules of academic integrity in research

ЗК 9	Ability to communicate in a foreign language to a sufficient extent to present and discuss the results of their scientific work orally and in writing, as well as for a full understanding of foreign scientific texts in the specialty
Professional competencies of the specialty (ФК)	
ФК 1	Ability to carry out professional and personal self-education, design of further educational route and professional career, participation in research and experimental activities
ФК 2	Ability to search, process and analyze information from various sources.
ФК 3	Ability to find, process and analyze the necessary information for problem solving and decision making
ФК 4	Ability to communicate the results of own research to colleagues, including at the international level, to communicate in dialogue with the wider scientific community, to conduct scientific discussions, to carry out joint research and to prepare joint publications
ФК 5	Ability to present research results in funding applications, research projects, grant applications
ФК 6	Ability to independently run research activities in the environmental field using up-to-date theories, methods and information and communication technologies
ФК 7	Ability to use adequate methods of effective interaction with representatives of different groups (social, cultural and professional)
ФК 8	Ability to adapt and summarize the results of up-to-date research in the field of ecology to solve scientific and practical problems
ФК 9	Ability to clearly and unambiguously communicate own conclusions, as well as the knowledge and explanations that substantiate them, to specialists and non-specialists, in particular to studying persons
ФК 10	Ability to run theoretical and experimental research, mathematical and computer modeling of environmental conditions
ФК 11	Ability to carry out the research
ФК 12	Ability to summarize the results of scientific and technical activities, to prepare scientific and technical publications based on the research results
ФК 13	Based on determination of the levels of environmental threats from existing industries, the ability to modernize the negative impacts control system and to develop effective measures to protect the environment
ФК 14	Ability to identify areas for improvement of organization, management and modernization of production to ensure efficient resource saving
ФК 15	Ability to carry out an expertise of existing productions and other facilities to determine the efficiency level in the use of raw materials and other natural resources
ФК 16	Ability to determine the technophilicity of natural areas, levels of man-made impact from objects of economic activity and, on the basis of comparative analysis, to develop a reliable system of environmental protection in modern technogenesis
ФК 17	Ability to carry out scientific and pedagogical activities in higher education using the latest pedagogical approaches and practices, including information technology, multimedia in the educational process for Ukrainian and foreign audiences, to diversify teaching methods for better understanding of the information
ФК 18	Ability to identify partners for joint research activities at the international level, to coordinate work with research partners in the implementation of research projects
ФК 19	Ability to assess natural resource reserves at the local, regional and national levels
ФК 20	Ability to determine the dependence of environmental parameters on natural and anthropogenic factors using mathematical models, to predict changes in environmental elements depending on the intensity of man-made impacts, the dynamics of the distribution of individual components in the air and aquatic media

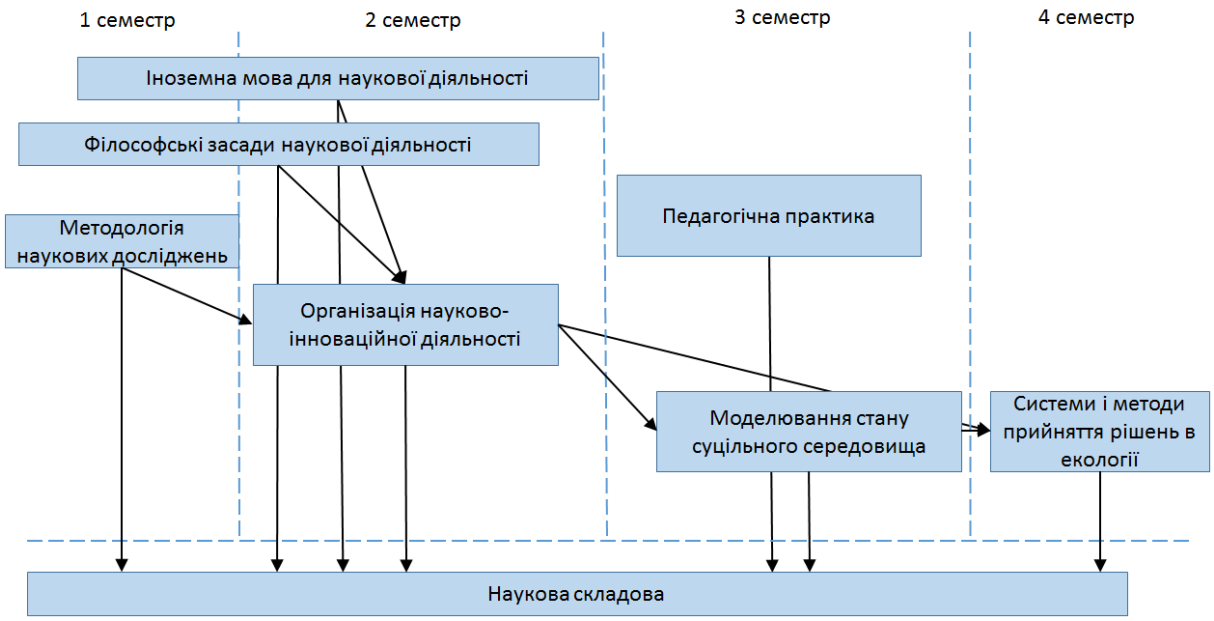
7 – Program learning outcomes	
ПР 1	To be able to use modern methods and technologies of scientific communication in Ukrainian and foreign languages
ПР 2	To understand the philosophical concepts of the scientific worldview, the role of science, to explain its impact on social processes
ПР 3	To be able to formulate and test hypotheses; to use appropriate evidence to substantiate the conclusions, in particular, the results of theoretical analysis, experimental research and mathematical and / or computer modeling, available literature data
ПР 4	To know the priority areas of state development of science, technology and engineering in professional and related fields
ПР 5	To apply methods of activating cognitive activity, to take into account the peculiarities of the methodology of giving different types of classes
ПР 6	To demonstrate awareness of modern environmental strategies, environmental legislation, regulations on environmental protection
ПР 7	To adhere to the rules of academic integrity
ПР 8	To initiate the creation of the latest scientific and technological goals based on productive thinking
ПР 9	To work independently or in a team during the formation and implementation of a research and innovation research project
ПР 10	To freely present and discuss the results of research, scientific and applied problems of the field with specialists and non-specialists in national and foreign languages, skillfully to reflect the results of research in scientific publications in leading international scientific journals
ПР 11	Professionally process, analyze, summarize and scientifically substantiate the scientific research results with generation of the latest theoretical background and innovative environmental protection solutions
ПР 12	To formulate educational goals and to choose the appropriate educational material and its structure
ПР 13	To develop mathematical models that describe the state of individual elements of the environment and the behavior of individual pollutants in a given media
ПР 14	To model technological processes, the efficiency of the implementation of which depends on the intensity of the formation of toxic ingredients
ПР 15	To know the methodology of scientific research in the subject area and modern methods of planning and setting up the experiments
ПР 16	To establish contacts and organize scientific work with potential partners in the areas of research for mutually beneficial cooperation
ПР 17	To determine and justify the allowable consumption rate of vital raw materials, materials, soils, water resources without significant deterioration of the environment
ПР 18	To develop an action plan for reliable control of man-made factors on the environment, to create systems to protect the environment from harmful effects
ПР 19	To read and understand foreign language texts by specialty
ПР 20	To know and adhere to the basic principles of academic integrity in scientific and educational (pedagogical) activities
8 – Resource support for program implementation	
Staffing	In accordance with the staffing requirements to support educational activities for the appropriate HE level, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 (valid) in the edition dated 23.05.2018 № 347. Staffing complies with applicable license requirements.

Material-technical support	In accordance with the technological requirements for material-technical support of educational activities of the relevant HE level, approved by the Resolution of the Cabinet of Ministers Of Ukraine dated 30.12.2015 № 1187 (current) as amended by 23.05.2018 № 347. A specialized laboratory, a complex of laboratories of the department and the auditorium, equipped with necessary instruments for research, technical means of demonstration, including multimedia systems, are available for research. There are research and training complexes "Environmentally friendly technologies for humans" and "Surface Chemistry and Physics" of Igor Sikorsky KPI and the Department of Chemistry of the National Academy of Sciences of Ukraine, on the basis of which graduate students learn from the field of solving environmental problems. There is an option of remote information exchange and interaction with teachers.
Information and educational-methodical support	In accordance with the technological requirements for training-methodological and informational support of education activities of the appropriate HE level, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187 (valid) in the edition dated 23.05.2018 № 347.
9 – Academic mobility	
National credit mobility	Possibility of making agreements on academic mobility in accordance with the current legislation of Ukraine in the field of the higher education.
International credit mobility	Erasmus + KA1 academic mobility program, participation in the university's academic mobility programs on a competitive basis.
Training of foreign HE applicants	Training can be carried out in English in separate academic groups or in Ukrainian in joint groups with Ukrainian applicants.

2. LIST OF COMPONENTS OF THE EDUCATIONAL COMPONENT OF THE EDUCATIONAL AND SCIENTIFIC PROGRAM

Code	Educational components	ECTS Credits	Форма підсумкового контролю
Normative components			
H 1	Philosophical foundations of scientific activity	6	final test, exam
H 2	Foreign language for scientific activity	6	final test, exam
H 3	Methodology of Scientific Research	4	exam
H 4	Simulation of the State of Continua	4	exam
H 5	Systems and Methods of Decision Making in Ecology	4	exam
H 6	Organization of scientific and innovative activities	4	final test
H 7	Pedagogical practice*	2	final test
Elective components			
B 1	Educational component 1 F-Catalog	5	final test
B 2	Educational component 2 F-Catalog	5	final test
Total of **normative educational components**:		**30**	
Total of **elective educational components**:		**10**	
TOTAL		**40**	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. SCIENTIFIC COMPONENT

Year	The content of the graduate student's scientific work	Forms of control (Reporting)
1st year	The choice and substantiation of the topic of own scientific research, formation of an individual work plan; selection and substantiation of the methodology of own research, review and analysis of existing approaches that have developed in modern science in the chosen field; carrying out of the dissertation under guidance of the supervisor. Preparation and publication of at least 1 publication on the topic of the dissertation in accordance with current requirements.	Approval of the individual plan of the postgraduate student at the academic council of the institute / faculty, reporting on the progress of the individual postgraduate plan twice a year.
2nd year	Conducting own scientific research under the guidance of the supervisor; preparation and publication of at least 1 article on the topic of the dissertation in accordance with current requirements; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual postgraduate student's plan twice a year.
3rd year	Conducting the dissertation research under the guidance of the supervisor; preparation and publication of at least 1 article on the topic of the dissertation in accordance with current requirements; participation in scientific and practical conferences (seminars) with the publication of abstracts.	Reporting on the progress of the individual postgraduate student's plan twice a year.

Year	The content of the graduate student's scientific work	Forms of control (Reporting)
4th year	Finalizing of the dissertation; filling out the scientific achievements of the post-graduate student in the form of a dissertation, summing up the completeness of the coverage of the results of the dissertation in scientific articles, according to the requirements. Implementation of the obtained results `and the receipt of supporting documents. Submission of documents for preliminary examination of the dissertation. Preparation of a scientific report for final examination (dissertation defense).	Reporting on the progress of the individual postgraduate student's plan twice a year. Providing a conclusion on the scientific novelty, theoretical and practical significance of the results of the dissertation.

5. FORM OF FINAL EXAMINATION OF HIGHER EDUCATION APPLICANTS

Graduation examination of applicants of higher education in the educational program "Ecology" Program Subject Area 101 "Ecology" is carried out in the form of dissertation defense and ends by the issue of a standard document on awarding the degree of Doctor of Philosophy with the qualification: Doctor of Philosophy in Ecology. Qualification work is checked for plagiarism and after the defense is placed in the repository of Scientific Library of the University for open access. Graduation examination is open and public.

6. MATRIX OF COMPLIANCE OF PROGRAM COMPETENCIES WITH THE COMPONENTS OF THE EDUCATIONAL PROGRAM

	Н 1	Н 2	Н 3	Н 4	Н 5	Н 6	Н 7	Scientific component
ЗК 1	+		+		+	+	+	+
ЗК 2	+				+			+
ЗК 3		+	+			+	+	+
ЗК 4						+		+
ЗК 5		+				+		+
ЗК 6	+	+	+	+		+		+
ЗК 7	+			+	+			+
ЗК 8	+							+
ЗК 9		+						+
ФК 1						+	+	+
ФК 2		+		+	+			+
ФК 3			+		+			+
ФК 4		+				+		+
ФК 5		+				+		+
ФК 6				+	+	+		+
ФК 7	+					+	+	+
ФК 8					+	+		+
ФК 9	+	+				+	+	+
ФК 10				+				+
ФК 11				+	+			+
ФК 12			+			+		+

	Н 1	Н 2	Н 3	Н 4	Н 5	Н 6	Н 7	Scientific component
ФК 13					+			+
ФК 14					+			+
ФК 15					+	+		+
ФК 16					+			+
ФК 17							+	+
ФК 18						+		+
ФК 19					+			+
ФК 20				+				+

7. MATRIX OF PROVIDING OF PROGRAM LEARNING RESULTS BY RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	Н 1	Н 2	Н 3	Н 4	Н 5	Н 6	Н 7	Scientific component
ПР 1		+				+		+
ПР 2	+							+
ПР 3	+		+	+				+
ПР 4					+	+		+
ПР 5							+	+
ПР 6					+	+		+
ПР 7	+				+			+
ПР 8	+							+
ПР 9						+		+
ПР 10		+				+		+
ПР 11					+			+
ПР 12							+	+
ПР 13				+				+
ПР 14				+				+
ПР 15	+		+					+
ПР 16						+		+
ПР 17					+			+
ПР 18					+			+
ПР 19		+						+
ПР 20	+							+