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 № 6 dated 07 September 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	**101 Ecology**
Educational qualification	**Doctor of Philosophy in Ecology**

Came into force by the Rector's Order of
Igor Sikorsky Kyiv Polytechnic Institute
dated 17.09.2020 № 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 № 1 dated 03.09.2020)

Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute

Head of the Methodological Council Yuriy YAKYMENKO
(protocol № 1 dated 03.09.2020)

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 № 2 dated 03.09.2020).

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 Educational 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, educational component of 40 ECTS credits, training period 4 years. The scientific component involves conducting own research and presenting of its results in the form of a dissertation.
Availability of accreditation	The program is not accredited. First accreditation will be carried out by Igor Sikorsky KPI in 2020-2021 academic year.
Cycle / level of HE	NFQ of Ukraine - level 9 QF-EHEA - the third cycle EQF-LLL - level 8
Prerequisites	Master's degree
Language (s) of instruction	Ukrainian / English
Term of the educational program	Until the next accreditation
Internet address of the permanent placement of the educational program	*https://eco-paper.kpi.ua/*, section "Educational programs" *https://osvita.kpi.ua/* section "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 of the 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 the EP	The program consists of educational and scientific components. The educational component includes blocks of general scientific and universal disciplines, disciplines for gaining in-depth knowledge of the specialty, that form general and professional competencies of the specialty, as well as elective disciplines corresponding to the subject (direction) of graduate student and are important for further scientific and research career. The scientific component involves conducting own research and dissertation defense. The program provides for pedagogical practice, the possibility to teach certain special courses in a foreign language, international activities in the field of mobility and internships for graduate students and teachers.
4 – Qualification of graduates for employment and further studying	
Qualification for employment	Graduates 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, presentations, tests and exams. Dissertation defense.
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 (GC)	
GC 1	Ability to critically analyze, evaluate and synthesize new and complex ideas
GC 2	Ability to rethink existing and create new integrated knowledge and/or professional practice and to solve significant social, scientific, cultural, ethical and other problems
GC 3	Ability to develop and implement projects, including own research
GC 4	Ability to initiate research and innovation projects and work individually during their implementation
GC 5	Ability to plan and organize the activity of research teams to solve scientific and scientific-educational tasks
GC 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
GC 7	Ability to use basic knowledge of various sciences in general professional activity
Professional competencies of the specialty (PC)	
PC 1	Ability to carry out professional and personal self-education, design of further educational route and professional career, participation in research and experimental activities
PC 2	Ability to apply up-to-date information technologies in various types of professional activities
PC 3	Ability to find, process and analyze the necessary information for problem solving and decision making
PC 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
PC 5	Ability to present research results in funding applications, research projects, grant applications
PC 6	Ability to independently run research activities in the environmental field using up-to-date theories, methods and information and communication technologies
PC 7	Ability to use adequate methods of effective interaction with representatives of different groups (social, cultural and professional)
PC 8	Ability to adapt and summarize the results of up-to-date research in the field of ecology to solve scientific and practical problems
PC 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
PC 10	Ability to run theoretical and experimental research, mathematical and computer modeling of environmental conditions
PC 11	Ability to carry out the research
PC 12	Ability to summarize the results of scientific and technical activities, to prepare scientific and technical publications based on the research results
PC 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
PC 14	Ability to identify areas for improvement of organization, management and modernization of production to ensure efficient resource saving
PC 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
PC 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

PC 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
PC 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
PC 19	Ability to assess natural resource reserves at the local, regional and national levels
PC 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 (PO)	
PO 1	To have modern methods and technologies for the implementation of scientific communication in Ukrainian and foreign languages with representatives of social, cultural, professional groups
PO 2	To know and understand the basic principles of general scientific methodological methods of organizing scientific research
PO 3	To be able to apply methods of optimal planning and implementation of experimental research, theoretical substantiation, criterion, variance, mathematical and computer modeling in ecology
PO 4	To know the priority areas of state development of science, technology and engineering in professional and related fields
PO 5	To apply methods of activating cognitive activity, to take into account the peculiarities of the methodology of giving different types of classes
PO 6	To demonstrate awareness of modern environmental strategies, environmental legislation, regulations on environmental protection
PO 7	To search, process, critically analyze and use information sources in solving specific problems and reasoning of made decisions
PO 8	To initiate the creation of the latest scientific and technological goals based on productive thinking
PO 9	To work independently or in a team during the formation and implementation of a research and innovation research project
PO 10	To prepare scientific results for publication, present them at scientific and scientific-technological forums, conferences, seminars in Ukrainian and foreign languages
PO 11	Professionally process, analyze, summarize and scientifically substantiate the scientific research results with generation of the latest theoretical background and innovative environmental protection solutions
PO 12	To formulate educational goals and to choose the appropriate educational material and its structure
PO 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
PO 14	To model technological processes, the efficiency of the implementation of which depends on the intensity of the formation of toxic ingredients
PO 15	To choose the most optimal methodologies for research, to process and analyze experimental and calculated data on the basis of ideas about the methods of scientific research
PO 16	To establish contacts and organize scientific work with potential partners in the areas of research for mutually beneficial cooperation
PO 17	To determine and justify the allowable consumption rate of vital raw materials, materials, soils, water resources without significant deterioration of the environment

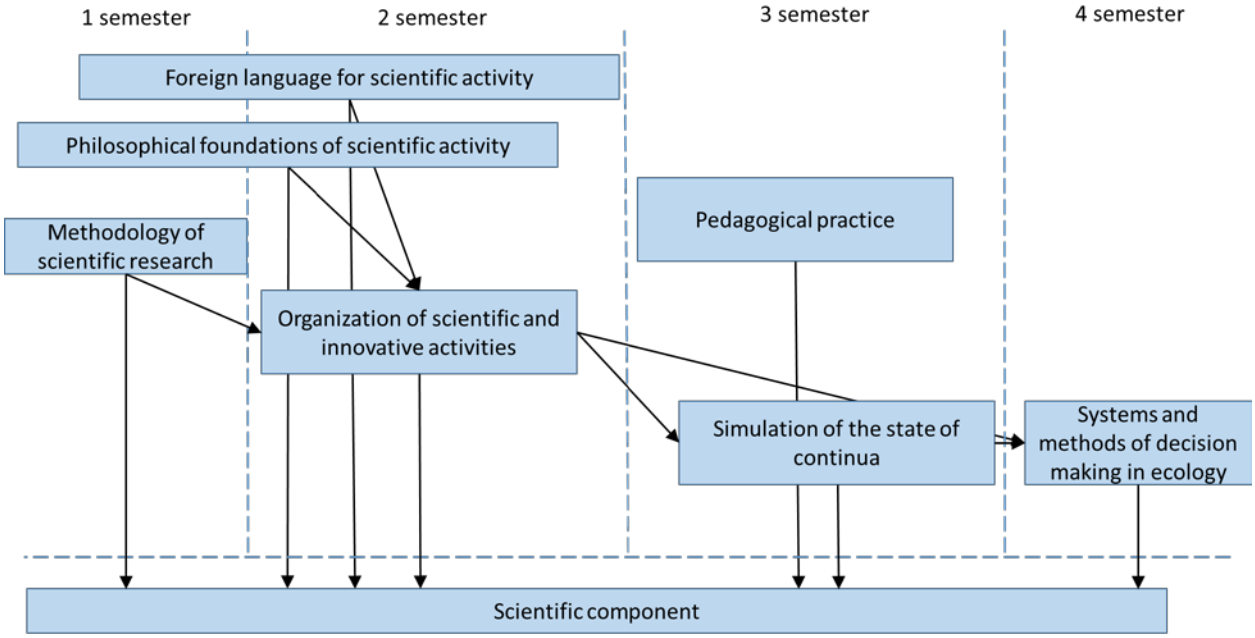
PO 18	To develop an action plan for reliable control of man-made factors on the environment, to create systems to protect the environment from harmful effects
8 – Resource support for program implementation	
Staffing	In accordance with the staffing requirements to support educational activities for the 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. Involvement of professional practitioners and lecturers from other higher education institutions in teaching professional-oriented disciplines. 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 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. Meets license requirements.
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. Use of the library at the department and the Scientific and Technical Library of Igor Sikorsky KPI.
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	Education is conducted in English, Ukrainian is studied as a foreign language

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

Code	Educational components	ECTS Credits	Форма підсумкового контролю
Normative components			

N 1	Philosophical foundations of scientific activity	6	final test, exam
N 2	Foreign language for scientific activity	6	final test, exam
N 3	Methodology of scientific research	4	exam
N 4	Simulation of the state of continua	4	exam
N 5	Systems and methods of decision making in ecology	4	exam
N 6	Organization of scientific and innovative activities	4	final test
N 7	Pedagogical practice*	2	final test
Optional components			
O 1	Educational component 1 F-Catalog	5	final test
O 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.

Year	The content of the graduate student's scientific work	Forms of control (Reporting)
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.
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

	N 1	N 2	N 3	N 4	N 5	N 6	N 7	Scientific component
GC 1	+		+		+	+	+	+
GC 2	+				+			+
GC 3		+	+			+	+	+
GC 4						+		+
GC 5		+				+		+
GC 6	+	+	+	+		+		+
GC 7	+			+	+			+
PC 1						+	+	+
PC 2				+	+			+
PC 3			+		+			+

PC 4		+				+		+
PC 5		+				+		+
PC 6				+	+	+		+
PC 7	+					+	+	+
PC 8					+	+		+
PC 9	+	+				+	+	+
PC 10				+				+
PC 11				+	+			+
PC 12			+			+		+
PC 13					+			+
PC 14					+			+
PC 15					+	+		+
PC 16					+			+
PC 17							+	+
PC 18						+		+
PC 19					+			+
PC 20				+				+

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

	N 1	N 2	N 3	N 4	N 5	N 6	N 7	Scientific component
PO 1		+				+		+
PO 2	+							+
PO 3			+	+				+
PO 4	+				+	+		+
PO 5							+	+
PO 6					+	+		+
PO 7					+			+
PO 8	+							+
PO 9						+		+
PO 10		+				+		+
PO 11					+			+
PO 12							+	+
PO 13				+				+
PO 14				+				+
PO 15			+					+
PO 16						+		+
PO 17					+			+
PO 18					+			+