

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY
"KHARKIV" POLYTECHNIC INSTITUTE"



APPROVE

Rector NTU "KhPI"

Yevhen SOKOL

" 04 " 2025 years

EDUCATIONAL-PROFESSIONAL PROGRAM

"Engineering Ecology"

Second (Master's) level of higher education

in the specialty E2 " Ecology "

Fields of knowledge E – Natural sciences, mathematics and statistics

Qualification Master in Ecology

APPROVED

SCIENTIST BY THE NTU COUNCIL
"KhPI"

Head Scientist councils

Yevhen SOKOL

Protocol № 4

"28" 03 2025 yr.

Kharkiv 2025

AGREEMENT SHEET

Educational-professional program " Engineering Ecology"

Level higher Education Second (Master's)

Field of knowledge E – Natural sciences, mathematics and statistics

Specialty E 2 "Ecology"

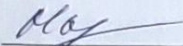
Qualification Master of Science in Ecology

APPROVED

Working group of the program

"Engineering Ecology"

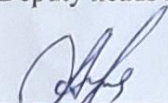
Guarantor of the educational program

 Evgenia MANOILO
"24" 03 2025 yr.

RECOMMENDED

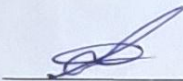
Methodological Council of NTU "KhPI"

Deputy heads methodical councils

 Ruslan MIGUSHCHENKO
"26" 03 2025 yr.

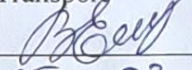
AGREED

Head of the Department of Chemical Engineering and Industrial Ecology

 Olexey SHESTOPALOV
"24" 03 2025 yr.

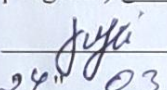
AGREED

Director of the Institute of Education and Science in Mechanical Engineering and Transport

 Vitaliy YEPYFANOV
"25" 03 2025 yr.

AGREED

Student (member of the working group of the program) groups MIT-M12 4

 Olesya KVITA
"24" 03 2025 yr.

APPROVED AND ENFORCED

By order of the rector of the National Technical University "Kharkiv Polytechnic" Institute" dated "02" 04 2025 №. 111-02

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REVIEWERS:

Productive comments and feedback on the educational program project were received from:

1. Leonid PLYATSUK, Doctor of Technical Sciences, Professor, Head of the Department of Ecology and Environmental Protection Technologies, Sumy State University
2. Andriy SHKOP, Ph.D., Director of LLC NCC "Ekomash"

РЕЦЕНЗІЯ

на освітньо-професійну програму “Інженерна екологія” другого рівня вищої освіти за спеціальністю Е2 «Екологія», що розроблена кафедрою хімічної техніки та промислової екології НТУ «ХПІ»

Освітня програма «Інженерна екологія» Національного технічного університету «Харківський політехнічний інститут» є сучасним і високоякісним навчальним продуктом, що відповідає актуальним викликам сьогодення у сфері охорони довкілля та сталого природокористування. Програма розроблена з урахуванням сучасних наукових досягнень і практичних потреб ринку праці, що робить її надзвичайно цінною для підготовки фахівців нового покоління.

Перш за все, варто відзначити чітку структуру та логічність викладу загальної інформації про програму.

Важливо, що навчання проводиться українською та англійською мовами, що відкриває широкі можливості для міжнародної співпраці та мобільності студентів.

Цінним аспектом для поліпшення програми є розвиток міжнародного співробітництва та обміну студентами. Надання можливостей для участі в міжнародних проектах та програмі обміну допоможе студентам розширити свої горизонти та підготуватися до роботи в глобальному екологічному середовищі.

Мета освітньої програми сформульована чітко і комплексно. Вона поєднує високий рівень професійної підготовки з формуванням наукового світогляду та широкого економічного і професійного кругозору. Такий підхід забезпечує не лише теоретичну, а й практичну підготовку, що є надзвичайно важливим для екологічної інженерії, де необхідно вміти застосовувати знання на практиці для вирішення складних екологічних проблем.

Характеристика освітньої програми демонструє глибоке розуміння предметної області. Вона охоплює природничі науки та фундаментальні науки, що є основою для екологічних досліджень. Особливо цінним є акцент на вивчення антропогенного впливу на довкілля. Це свідчить про системний підхід до підготовки фахівців, які зможуть не лише аналізувати, а й розробляти ефективні природоохоронні заходи.

Методологічна база програми включає освоєння сучасних методів збору, обробки та інтерпретації екологічних даних, що є ключовим для якісної наукової роботи. Використання сучасного обладнання та програмного забезпечення для лабораторних і польових досліджень підвищує практичну цінність навчання і готує студентів до реальних викликів професійної діяльності.

Орієнтація програми на підготовку висококваліфікованих фахівців є надзвичайно актуальною в умовах зростаючої уваги до екологічної безпеки та сталого розвитку. Випускники отримують навички розробки екологічно чистих технологій, проведення моніторингу, оцінки впливу на довкілля, що робить їх конкурентоспроможними на ринку праці і затребуваними в різних галузях промисловості.

Програма не лише відповідає вимогам часу, а й сприяє формуванню екологічної культури та відповідальності у студентів.

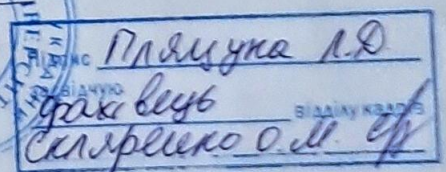
Загалом, освітня програма «Інженерна екологія» є зразком якісної магістерської підготовки, що поєднує фундаментальні знання з практичними навичками і науковим підходом. Вона сприяє формуванню компетентних, відповідальних і професійно підготовлених екологів, здатних ефективно працювати у сфері охорони довкілля та сталого природокористування.

Загалом, освітньо-професійна програма «Інженерна екологія» 2025 року являє собою цінну освітню пропозицію, яка має потенціал для розвитку і подальшого удосконалення із вимогами сьогодення. На мою думку, надана на рецензію ОПП цілком відповідає вимогам МОН та стандартам вищої освіти за спеціальністю Е2 «Екологія».

Д-р. техн. наук, професор,
Завідувач кафедри екології та
природозахисних технологій
Сумського державного університету



Л. Д. Пляцук



**ТОВАРИСТВО З ОБМЕЖЕНОЮ ВІДПОВІДАЛЬНІСТЮ
„НАУКОВО-ТЕХНІЧНИЙ ЦЕНТР
„ЕКОМАШ”**

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№ _____

від «___» _____ 202__ р.

РЕЦЕНЗІЯ

на освітньо-професійну програму «Інженерна екологія» другого рівня вищої освіти за спеціальністю Е2 «Екологія», що розроблена кафедрою хімічної техніки та промислової екології НТУ «ХП»

Освітня програма «Інженерна екологія» Національного технічного університету «Харківський політехнічний інститут» є прикладом сучасного підходу до підготовки висококваліфікованих фахівців у сфері екології та охорони навколишнього середовища. Програма відзначається чіткою структурою, що поєднує фундаментальні природничі науки, інженерні дисципліни та екологічний менеджмент.

Перш за все, слід відзначити високий рівень акредитації програми, що підтверджується сертифікатом Національного агентства забезпечення якості вищої освіти України з терміном дії до 2029 року. Це свідчить про відповідність програми сучасним стандартам освіти та її актуальність у контексті європейських освітніх вимог.

Мета програми сформульована чітко і відповідає сучасним викликам у сфері екології. Поєднання теоретичних знань з практичними навичками та науково-дослідною роботою створює умови для формування у студентів не лише професійних компетентностей, а й наукового світогляду. Такий підхід сприяє розвитку критичного мислення і здатності до інновацій, що є надзвичайно важливим у сучасному світі, де екологічні проблеми набувають глобального масштабу.

Особливу увагу заслуговує орієнтація програми на практичну діяльність. Студенти мають можливість опанувати сучасні методи екологізації

промислових виробництв, розробляти маловідходні та енергозберігаючі технології, що базуються на досягненнях науки і техніки. Це забезпечує випускникам конкурентоспроможність на ринку праці та можливість впливати на збереження довкілля через інноваційні рішення.

Програма також відзначається широким спектром можливостей для подальшого працевлаштування випускників. Перелік посад, на які можуть претендувати магістри, включає як наукові, так і управлінські позиції у державних та приватних структурах. Крім того, є можливість подальшого навчання на рівні доктора філософії та отримання додаткових кваліфікацій, що робить цю програму привабливою для амбітних студентів, які прагнуть професійного зростання.

Методика викладання, включає студентоцентроване навчання, проблемно-орієнтовані підходи, використання сучасних технологій як Microsoft 365, а також дуальне навчання і практичні стажування, що створює сприятливе середовище для глибокого засвоєння матеріалу. Такий різноманітний підхід до навчання сприяє розвитку як теоретичних знань, так і практичних навичок, необхідних для успішної професійної діяльності.

Оцінювання знань за допомогою рейтингової системи, усних та письмових екзаменів, тестування забезпечує об'єктивність і прозорість у визначенні рівня засвоєння навчального матеріалу. Це сприяє підтримці високих стандартів якості освіти.

Отже, освітня програма «Інженерна екологія» НТУ «ХПІ» є сучасною, комплексною і практично орієнтованою. Вона відповідає потребам ринку праці та сприяє формуванню висококваліфікованих фахівців, здатних ефективно працювати у сфері охорони довкілля та сталого природокористування. Рекомендується для студентів, які прагнуть отримати глибокі знання та практичні навички у галузі екології, а також для роботодавців, які шукають компетентних і мотивованих спеціалістів.

Директор ТОВ «НТЦ «Екомаш»



Шкоп А. О.

INTRODUCTION

It complies with the Standard of Higher Education of the second (master's) level in the field of knowledge 10 - Natural Sciences, specialty 101 "Ecology", approved and put into effect by the order of the Ministry of Education and Science of Ukraine dated October 4, 2018 No. 1066.

Developed by the working group of the educational program "Engineering Ecology" Educational and Scientific Institute of Mechanical Engineering and Transport of the National Technical University "Kharkiv Polytechnic Institute" consisting of:

Guarantor educational programs

Evgenia MANOILO
(first and last name)

Candidate of technical sciences, associate professor,
associate professor of the department of chemical
engineering and industrial ecology, NTU "KhPI"
(academic degree, academic title, position)

Working group members OP:

1. Vadym SEBKO, doctor of technical sciences, professor, professor of the department of chemical engineering and industrial ecology, NTU "KhPI"

(name and SURNAME , academic degree, academic title, position)

2. Tetyana KOZULYA, doctor of technical sciences, professor, professor of the department of chemical engineering and industrial ecology, NTU "KhPI"

(name and SURNAME , academic degree, academic title, position)

3. Olesya KVITA, student of the group MIT-M124

(applicant, first and last name , group)

1. EDUCATIONAL PROGRAM PROFILE FOR SPECIALTY

E2 "Ecology"

1 – General information	
Higher educational institution and structural unit	National Technical University "Kharkiv Polytechnic Institute", Educational and Scientific Institute of Mechanical Engineering and Transport Department of Chemical Engineering and Industrial Ecology
Higher education degree and title of qualification in the original language	Master, Master in Ecology
Professional qualification	There is a professional standard No professional qualification is awarded.
Form of study	Institutional (full-time), part-time
Official name of the educational program	Engineering ecology
Names of specializations (subject specialties)	No specialization
Type of diploma and scope of the educational program	Master's degree, single, 90 ECTS credits, study period – 1 year 4 months
Availability of accreditation	National Agency for Quality Assurance in Higher Education. Ukraine. Certificate – No. 8135. Validity period – 01.07.2029.
Cycle/level	Second (master's) level of higher education; NQF of Ukraine – level 7; QF-EHEA – second cycle; EQF-LLL – level 7
Prerequisites	Possession of a bachelor's or master's degree
Language of instruction	Ukrainian/English language
Duration of the educational program	According to the validity period of the certificate, it is reviewed annually
Link to permanent placement of the educational program	https://blogs.kpi.kharkov.ua/v2/quality/osvitnij-riven-magistr-vstup-2025-2026-navchalnogo-roku
2 – Purpose of the educational program	
The goal of the educational program is to combine a high level of professional training with the formation of a scientific worldview in the student and provide a broad perspective in the economic and professional sphere in the field of ecology, environmental protection and balanced use of nature through theoretical, practical training, and scientific research work. Achieving this goal is based on the principles of continuity and individualization of training, fundamentality and integrity of knowledge provision, practical orientation and awareness of the place of the acquired competencies, symbiosis of scientific and systemic approaches, etc.	

3 – Characteristics of the educational program	
Subject area (field of knowledge)	Field of knowledge: E – Natural sciences, mathematics and statistics Specialty: E2 "Ecology" Specialization: none Object of study: Structure and functional components of ecosystems of various levels and origins; anthropogenic impact on the environment and optimization of natural resources. Learning objectives: Formation of a complex of knowledge, skills and abilities among higher education students for application in professional activities in the field of ecology, environmental protection and sustainable nature management. Theoretical content of the subject area: Concepts, concepts, principles of natural sciences, modern ecology and their use for environmental protection, balanced nature management and sustainable development. Methods, techniques and technologies: The applicant must master the methods of collecting, processing and interpreting the results of environmental research. Tools and Equipment: Equipment, facilities, and software necessary for field, laboratory, and remote studies of the structure and properties of ecological systems of various levels and origins.
Orientation of the educational program	Educational and professional. The educational program is aimed at training highly qualified specialists capable of solving urgent problems in the field of environmental protection and rational use of natural resources. The program combines fundamental knowledge of natural sciences, engineering disciplines and environmental management. This allows graduates to work effectively in various areas related to environmental safety. They gain skills in developing and implementing environmentally friendly technologies, conducting environmental monitoring, assessing environmental impact on the environment, developing environmental documentation, and managing environmental projects.
The main focus of the educational program	Keywords: ecology, natural sciences, ecological systems, environment, anthropogenic impact, environmental protection, balanced nature management, environmental protection technologies, resource conservation, greening of production, clean technologies, sustainable development. The emphasis is on acquiring skills and knowledge in ecology, environmental protection, and sustainable use of nature. The program structure provides for dynamic and interactive learning. The program offers a comprehensive approach to solving modern environmental problems at the local, regional and national levels. The educational components of the program

	are based on theoretical knowledge, which is closely related to practical skills. The program allows students to acquire the necessary skills in the field of environmental protection and balanced nature management and sustainable development.
Features programs	The features of the second-level Engineering Ecology program are that it provides in-depth study of scientific methods for developing engineering environmental protection complexes to minimize anthropogenic impact on the environment, and trains masters who are able not only to apply modern methods of greening industrial production, but also to develop new low-waste and energy-saving technologies based on modern achievements of science and technology.
4 – Graduates’ employability and further education	
Employment eligibility	Scientific and teaching activities in the field of ecology. Scientific, administrative and managerial activities in educational institutions and public institutions. Positions according to the classifier of Ukraine: (DK 003:2010) • 1237. 223908 1 Head of the Environmental Protection Department; • 1412 Environmental manager; • 2149. 222364 1 Environmental Engineer; • 2211.2 Ecologist; • 2211.2 Environmental expert; • 2213.2 Natural ecosystem restoration engineer; • 2213.2 Water Resources Engineer; • 2213.2 Engineer for the protection of natural ecosystems; • 2213.2 Environmental Engineer; • 2211.2 Environmental auditor; • 3439 State Inspector for Technogenic and Environmental Supervision; • 3439 Environmental manager; • 3439 Surveying Engineer; • 3449 Inspector for the protection of the nature reserve fund. According to the professional Standard “Ecologist”, approved and put into effect by order of the Ministry of Economy of Ukraine dated 04.05.2022 No. 1111-22: • ecologist; • ecologist of the second category; • ecologist of the first category; • leading ecologist.
Academic rights of graduates	Studying at universities in Ukraine and abroad to obtain a PhD degree. Obtaining additional qualifications in the postgraduate education system. Educational programs, research grants, and scholarships that contain additional scientific and educational components.

5 – Teaching and assessment	
Teaching and learning	Student-centered learning, problem-based learning, Microsoft 365 learning, self-study, laboratory-based learning, research-based learning, dual learning; internship/practicum; workplace practice (industrial practice); Teaching methods depend on the form of study (full-time, part-time, distance learning). Teaching is carried out in the form of: lectures, multimedia lectures, interactive lectures, seminars, practical classes, laboratory work. Also provided independent work with the possibility of consultations with the teacher on individual educational components, individual lessons, group project work.
Evaluation	Rating system of assessment, oral and written exams, testing. Monitoring of students' knowledge and skills is carried out in the form of current, intermediate and final control. Monitoring of the success of a higher education applicant is carried out in the form of current and final control, as well as state certification. Current control is carried out during practical and laboratory classes, as well as tests and is aimed at checking the assimilation of the content of the modules of the academic discipline by higher education applicants. Final control is carried out in order to determine the level of assimilation of theoretical and practical material from the academic discipline and to assign a final grade. The final grade can be assigned based on the results of the exam, credits, or as a result of accumulating grades from individual modules if the applicant completes all types of current control measures. State certification - preparation and public defense (presentation) of the final qualification work. Assessment is carried out according to the national scale (“excellent”, “good”, “satisfactory”, “unsatisfactory”), a 100-point scale and the ECTS scale (A, B, C, D, E, FX, F), which is reflected in the syllabi of the disciplines.
6 – Software competencies	
Integral competence	The ability to solve complex specialized tasks and solve practical problems in the field of ecology, environmental protection and sustainable use of nature in the performance of professional activities, or in the process of learning, which involves the application of basic theories and methods of environmental sciences, and are characterized by the complexity and uncertainty of conditions and requirements.
General competencies (defined by the higher education)	GC-1. The ability to learn and master modern knowledge. GC-2. The ability to make informed decisions. GC-3. The ability to generate new ideas. GC-4. Competence to develop and manage projects.

standard)	GC-5. Competence to communicate in a foreign language. GC-6. Competence to search, process, and analyze information from various sources. GC-7. Competence to motivate people and work towards a common goal.
Special (professional) competencies (defined by the higher education standard of the specialty)	SC-1. Awareness of the latest achievements necessary for research and/or innovation in the field of ecology, environmental protection, and sustainable use of natural resources. SC-2. Ability to apply interdisciplinary approaches in critically analyzing ecological problems. SC-3. Ability to use principles, methods, and organizational procedures of research and/or innovation activities. SC-4. Ability to apply new approaches to analyzing and predicting complex phenomena, and critically evaluating problems in professional activities. SC-5. Ability to present knowledge and personal conclusions to both experts and non-experts. SC-6. Ability to manage the strategic development of a team in the process of professional activity in the field of ecology, environmental protection, and balanced nature management. SC-7. Ability to organize work related to the assessment of the environmental status, environmental protection and nature management optimization, in conditions of incomplete information and conflicting requirements. SC-8. Ability for self-education and professional development based on innovative approaches in the field of ecology, environmental protection, and balanced nature management. SC-9. Ability to independently develop ecological projects through the creative application of existing and generating new ideas. SC-10. Ability to assess the level of negative impact of natural and anthropogenic factors of ecological danger on the environment and human. SC-11. Ability to integrate modern scientific knowledge to develop and implement effective systems of environmental monitoring and risk management associated with industrial accidents and disasters. SC-12. Ability to use innovative tools and techniques to develop and optimise environmentally sound technologies.
7 – Learning outcomes	
Learning outcomes by specialty (defined by the higher education standard)	RE-1. Know and understand the fundamental and applied aspects of environmental sciences. RE-2. Be able to use conceptual ecological patterns in professional activities. RE-3. Know the basic concepts of natural science, sustainable

	development, and scientific methodology at the level of the latest achievements. RE-4. Know legal and ethical norms for evaluating professional activities, developing and implementing socially significant environmental projects under conflicting requirements. RE-5. Demonstrate the ability to organize collective activities and implement complex nature conservation projects, taking into account available resources and time constraints. RE-6. Know the latest methods and tools of environmental research, including methods and tools of mathematical and geoinformational modeling. RE-7. Be able to communicate in a foreign language in scientific, production, and socio-economic spheres of activity. RE-8. Be able to clearly and unambiguously convey professional knowledge, own reasoning, and conclusions to specialists and the general public. RE-9. Know the principles of personnel and resource management, basic approaches to decision-making under incomplete/insufficient information and conflicting requirements. RE-10. Demonstrate awareness of the latest principles and methods of environmental protection. RE-11. Be able to use modern information resources on ecology, nature use, and environmental protection. RE-12. Be able to evaluate landscape and biological diversity and analyze the consequences of anthropogenic impact on natural environments. RE-13. Be able to evaluate the potential impact of technological objects and economic activities on the environment. RE-14. Apply new approaches to develop decision-making strategies under complex unpredictable conditions. RE-15. Evaluate environmental risks under conditions of insufficient information and conflicting requirements. RE-16. Choose the optimal management and/or nature use strategy depending on environmental conditions. RE-17. Critically analyze theories, principles, methods, and concepts from different subject areas to solve practical problems and ecological issues. RE-18. Be able to use modern methods of information processing and interpretation in innovative activities. RE-19. Be able to independently plan the implementation of innovative tasks and formulate conclusions based on their results. RE-20. Have knowledge of the basics of ecological engineering design and environmental impact assessment. RE -21. Know modern methods and tools for conducting a
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	comprehensive environmental audit and environmental monitoring, apply them to assess the state of the environment and the impact of various factors on it. RE -22. Have the skills to develop and implement effective strategies for managing natural resources and preventing negative environmental impacts, taking into account current environmental challenges and global trends. RE -23. Ability to analyze and synthesize information for the development of innovative environmental technologies and methods that reduce environmental burden and increase the efficiency of environmental management.
8 – Resource provision for program implementation	
Human resources	Complies with the licensing procedures for educational activities approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 No. 1187 " On approval Licensed conditions proceedings educational activities institutions education" (as amended by Resolution of the Cabinet of Ministers No. 365 of March 24, 2021. Appendix 15-16).
Material and technical support	Meets the technological requirements for the material and technical support of educational activities in the field of higher education in accordance with the requirements of the Licensing Conditions approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187 (as amended by the Resolution of the Cabinet of Ministers of Ukraine № 365 dated March 24, 2021, Appendix 17). NTU "KhPI" has classrooms that meet the requirements for conducting classes according to the program. The educational process uses computer equipment of the departments, which meets the requirements for the quantity and quality of equipment.
Information and educational and methodological support	Meets the technological requirements for the material and technical support of educational activities in the field of higher education in accordance with the requirements of the Licensing Conditions approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015 № 1187 (as amended by the Resolution of the Cabinet of Ministers of Ukraine № 365 dated March 24, 2021. Appendix 18). Information about educational and professional programs, educational, scientific and educational activities carried out by the university's structural divisions within the framework of this bachelor's training program is available through the official website of NTU "KhPI": https://www.kpi.kharkov.ua/ukr/ and graduating department of chemical engineering and industrial ecology : https://web.kpi.kharkov.ua/htpe/ .

	Textbooks and textbooks, scientific publications (articles) of the department's staff are available at: http://repository.kpi.kharkov.ua/handle/KhPI-Press/7479 . All electronic resources are available to readers through the own website of the scientific and technical library of NTU "KhPI": http://library.kpi.kharkov.ua/ . The program is fully equipped with educational and methodological complexes of all components, the availability of which is presented in the modular environment of the university's educational process. For each educational component of the program, applicants are provided with the necessary basic educational materials (textbooks, educational and methodological manuals, and developments) and are accompanied by additional scientific and scientific and technical developments. Syllabuses of educational components are posted on the department's website at the link https://web.kpi.kharkov.ua/http/ychebpro/magistratura-101-24/
9 – Academic mobility	
National credit mobility	Based on bilateral agreements between the National Technical University "Kharkiv Polytechnic Institute" and leading technical universities of Ukraine. The procedure for organizing academic mobility programs for participants in the educational process is regulated by the "Regulations on Academic Mobility of Students, Postgraduate Students, Doctoral Students, Scientific and Pedagogical and Research Workers of the University ", which is posted on the website of the educational department. https://blogs.kpi.kharkov.ua/v2/nv/dokumenty/normatyvni-dokumenty/ . "Regulations on the procedure for expulsion, interruption of studies, renewal and transfer of higher education applicants, as well as granting them academic leave and the right to re-study at NTU "KhPI", which is also posted on the website of the educational department, https://blogs.kpi.kharkov.ua/v2/nv/dokumenty/normatyvni-dokumenty/ establishes the procedure for expulsion, interruption of studies, renewal and transfer of persons studying in duly licensed educational programs. The Regulation also applies to persons studying in accredited (if accreditation is provided for by national legislation) educational programs in educational institutions of foreign countries, in the event of their renewal or transfer to NTU "KhPI".
International credit mobility	A bilateral agreement on semester exchange has been concluded with the Pomeranian Academy in Slupsk (Poland). Also on the basis of agreements and memorandums between the

	National Technical University "Kharkiv Polytechnic Institute" and higher educational institutions of foreign partner countries. Regulated by the "Regulations on student training and internships (scientific internships) of postgraduate students, associate professors and doctoral candidates, scientific and scientific-pedagogical workers in leading higher educational institutions and scientific institutions abroad." https://blogs.kpi.kharkiv.ua/v2/nv/dokumenty/normatyvni-dokumenty/
Education of foreign students	According to the license, training of foreigners and stateless persons is envisaged. Education of foreign students can be carried out on general terms or according to an individual schedule. Admission and conditions for recognition of prior educational level for foreign students and stateless persons are carried out in accordance with https://zakon.rada.gov.ua/laws/show/686-2021-n#Text The educational document on the basis of which admission is made, together with the appendix and their translations into Ukrainian, are analyzed for compliance (validation) for admission to a higher education institution and the recognition procedure. Validation is carried out by the institution entrusted with the functions of the National Information Center for Academic Mobility or by the admissions committee of the higher education institution in the manner prescribed by law, and involves checking the correctness of the documents, compliance with the conditions of admission with the educational program.

2. LIST OF EDUCATIONAL COMPONENTS OF THE EDUCATIONAL PROGRAM "ENGINEERING ECOLOGY" AND THEIR LOGICAL SEQUENCE

2.1. List of components of the educational and professional program

Code of the company	Components of the educational program (teaching educational components, course projects (papers), internships, qualification work)	Number of credits	Final control form
1. Compulsory educational components OP			
General training			
GT1	Fundamentals of scientific research	3.0	Test
GT2	Innovative entrepreneurship and startup project management	3.0	Test
GT3	Intellectual property	3.0	Test
GT4	Environmental education	3.0	Test
Special (professional) training			
ST1	Management of technogenic and environmental safety	5.0	Exam
ST2	Ecological principles of sustainable development of the country / Sustainable development base	4.0	Test
ST3	Environmental management	4.0	Test
ST4	Eco-innovation in the creation of new technologies	4.0	Exam
ST5	Scientific research and modeling in ecology	4.0	Exam
ST6	International Cooperation and Grant Writing in Environmental Protection	3.0	Exam
2 Practical training			
PP1	Pre-graduate internship	12.0	Test
3. Attestation			
	Attestation	10.0	Public defense

Code of the company	Components of the educational program (teaching educational components, course projects (papers), internships, qualification work)	Number of credits	Final control form
Total volume components:		58	
4. Elective educational components			
4.1. Educational components of free choice of vocational training general institute catalog			
	Educational component 1	4	Test
	Educational component 2	4	Test
	Educational component 3	4	Test
	Educational component 4	4	Test
	Educational component 5	4	Test
	Educational component 6	4	Test
Educational components of free choice of professional preparation of a general institute catalog		24	
4.2. Educational components of free choice of the general university curriculum catalog			
	Educational component 1	4	Test
	Educational component 2	4	Test
Educational components of the free choice of the university-wide catalog		8	
Total volume of sample components:		32	
TOTAL VOLUME OF EDUCATION PROGRAMS:		90	

3. DISTRIBUTION OF THE CURRICULUM CONTENT BY GROUPS OF COMPONENTS AND TRAINING CYCLES

Distribution content educational programs by in groups components and cycles preparation

No. n/a	Cycle preparation	The applicant's academic workload higher education (ECTS credits) / %		
		Required components educational professional programs	Selective educational components professional programs	Total for the whole term of study
1	General preparation	12 /13.3	-	12 / 13.3
2	Special (professional) training	46/51.1	-	46 /5 1.1
3	Free components choice	-	32 /35.6	32 / 35.6
Total for the entire term teaching		58/ 64.4	32 /35.6	90/100

4. FORM OF CERTIFICATION OF HIGHER EDUCATION GRADUATES

Certification of higher education applicants is carried out in the form of a public defense of a qualifying master's thesis at an open meeting of the certification committee.

The qualification work involves an independent solution to a complex problem in the field of ecology, environmental protection and/or sustainable nature management, accompanied by research and/or the use of innovative approaches. The main results of the qualification work must be approved, published and checked for plagiarism. Plagiarism checking is performed using software and hardware. The qualification work must be placed in the repository of NTU "KhPI".

5. REQUIREMENTS FOR THE EXISTENCE OF AN INTERNAL QUALITY ASSURANCE SYSTEM IN HIGHER EDUCATION

The “Department of Quality Assurance of Educational Activities”, which is a structural unit of the National Technical University “Kharkiv Polytechnic Institute”, is responsible for ensuring the quality of educational activities and the quality of higher education.

Policy of software quality of higher education	The main principles of internal quality assurance of education at NTU KhPI: responsibility; adequacy; autonomy; measurability; the presence of academic culture and openness. The main procedures for internal quality assurance of education are: • Implementation of quality policy, addressing strategic goals and tasks permanent improvement quality; • Ensuring the publicity of information about educational programs, higher education degrees and qualifications; • Software compliance academic integrity by University employees and higher education students; • Preparation and conduct of monitoring and socio-psychological research to determine the needs of the labor market, the requirements of higher education stakeholders, the quality of educational services, and satisfaction with the quality of educational activities and the quality of education; • Involving stakeholders (higher education students, employers, representatives of the academic community, etc.) in decision-making in areas of internal quality assurance; • External assessment of the quality of NTU KhPI activities based on the results of participation in national and
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	international rankings of higher education institutions, fulfillment of Licensing requirements; • Participation in accreditation procedures and post-accreditation monitoring of the University's educational programs. Areas: development, approval, monitoring and periodic review of educational programs; ensuring advanced training of pedagogical, scientific and scientific-pedagogical employees; ensuring student-centered and practice-oriented training, teaching and assessment of higher education applicants; ensuring the availability of necessary resources for organizing the educational process; ensuring availability informational systems for effective management educational process. Based on the results of the quality management system audit, the University received a Quality Management System Certificate https://blogs.kpi.kharkov.ua/v2/quality/dokumenty/sistema-upravlinnya-yakistyu/
Quality assurance development, approval, monitoring, review and update educational programs	Monitoring and periodic review of educational programs is carried out according to with active normative documents in NTU KhPI annually . The review of educational programs is based on a satisfaction analysis: - educational needs of higher education applicants, the possibility of building an individual learning trajectory, compliance with academic freedoms in the educational process, satisfaction with the quality of the educational

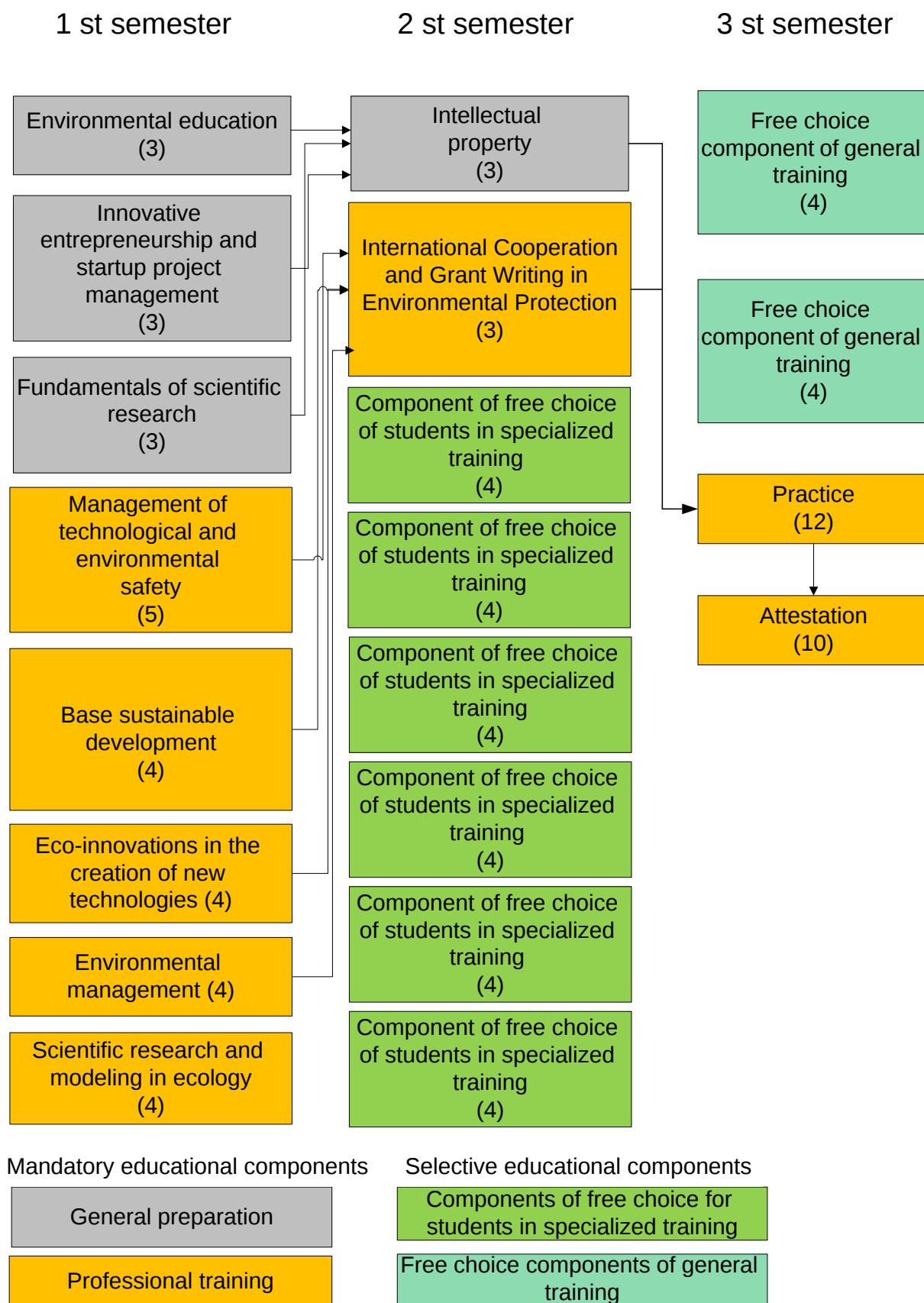
	program, etc.; - employers: the quality of formation of general and professional competencies, relevant and social skills (soft skills); - other stakeholders. To review educational programs, the following methods are used: online surveys, analysis of regulatory documents, analysis of the situation in accordance with the requirements for the structure and content of the educational program, the organization of the educational process under this program, and the quality of educational service provision. Periodicity viewing educational programs is carried out: a) annually based on monitoring results; b) after completing the educational program by applicants for higher education education, regarding the feasibility of its existence in the future; c) in case legislative changes and regulatory framework; d) according to the results of accreditation (general results of previous accreditations by industry, specialty, department, institute, university). https://blogs.kpi.kharkov.ua/v2/quality/yakist-osvity/accreditation-2023-2024/accreditation-2024-2025/
Ensuring enrollment, achievement, recognition, and certification applicants	The assessment of higher education applicants is consistent, transparent, and conducted in accordance with the procedures established at the University in accordance with regulatory acts. Annual assessment of education seekers is carried out in accordance with the forms of control defined by the

	educational program; the scale of assessment of learning outcomes, which is reflected in the syllabi of educational components; accounting, analysis and comparison of learning outcomes. Assessment of higher education seekers is carried out on basis 100-point accumulative point -rating systems. A rating system is used.
Quality assurance student-centered learning , teaching and assessment	The planning, distribution and provision of educational resources, and the provision of information and technical support take into account the needs of higher education applicants and the principles of student-centered learning. Internal quality assurance in higher education ensures that all necessary resources meet the learning objectives, are publicly available, and applicants higher education informed about them availability.
Quality assurance scientific and pedagogical workers	Annual rating evaluation of the activities of scientific and pedagogical staff and departments of the University is carried out through the use of performance evaluation and self-assessment mechanisms. scientific and pedagogical activity, its focusing on the priorities of the development of the national higher education system, University development strategy, personal and professional development of scientific and pedagogical staff. Results Rating assessments are based on the results of activities achieved during the academic year. The results of the annual assessment are posted on the official website of the University.
Resource software educational process	Institution higher education provides educational process necessary and available resources (human , methodological , material , informational) and etc.) and carries out appropriate

(training resources and support applicants higher education)	support applicants higher education . Organizational and methodical support independent works applicants higher education consists of in development methodical , didactic , instructive materials , provided opportunities to form , to consolidate , to deepen and systematize received under time classroom classes knowledge and ability to perform self-training and self-control at mastery educational - professional (scientific) program .
Information support (information management)	WITH purpose management educational process developed effective politics in field informational management and appropriate integrated informational system management educational process .
Publicity of information about educational programs, educational, scientific activities	Reliable, objective, relevant, timely and easily accessible information on the educational and professional (scientific) program is published on the website of NTU " KhPI ", including programs for potential higher education applicants, graduates, other stakeholders and the public. Information about educational activities in the specialty, including selection criteria for training; planned learning outcomes, is public. by this program; procedures teaching, teaching and evaluation.
Ensuring academic integrity	Software prevention and detection academic plagiarism in scientific works employees University and applicants higher education is being implemented through policy , standards and procedures compliance academic virtue and regulated such documents NTU KhPI : • Statute of the National Technical University "Kharkiv Polytechnic Institute" ;

	• <u>Code of Ethics for Academic Relations and Integrity of the National Technical University "Kharkiv Polytechnic Institute"</u> ; • <u>Regulations on the system for preventing and detecting academic plagiarism in final qualification works of higher education applicants of the National Technical University "Kharkiv Polytechnic Institute"</u> ; • <u>Regulations on the repository "Electronic archive of the National Technical University "Kharkiv Polytechnic Institute"</u> ; • <u>Regulations on the Electronic Repository of Qualification Theses of Higher Education Applicants at the National Technical University "Kharkiv Polytechnic Institute"</u>
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6. STRUCTURAL-LOGICAL DIAGRAM



7. MATRIX OF CORRELATION OF DEFINED LEARNING OUTCOMES, COMPETENCES AND EDUCATIONAL COMPONENTS

Learning outcomes		Integral competence	Competencies																		
			General competencies							Special (professional) competencies										Additional special (professional) competencies	
			GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10	SC-11	SC-12
RN from the standard	RE-1		GT1, GT4, ST2, ST3, ST5, ST6							GT1, ST2, ST4, ST5	ST1, ST2, ST4, ST5, ST6									GT1 ST1 ST5	
	RE-2		GT1 ST3 ST4							ST1										ST2	GT1 ST4
	RE-3		GT1 ST2							ST2 PP1											GT1
	RE-4					GT3 ST1					ST1	GT2		GT4							
	RE-5	GT2 GT3 ST1 ST3				GT2			GT3 ST3			GT3			GT3 ST3					ST1	
	RE-6										ST5		GT1 ST5								ST3 ST5
	RE-7						ST2 ST6							ST2 ST6			ST2 ST6				
	RE-8					GT2		GT2 ST5 PP1						GT4 ST5 PP1							
	RE-9					GT3 GT2			GT3 ST3						GT3 GT2 ST3						
	RE-10	GT2 ST4		ST4, PP1												ST4				ST1 ST3	ST1
	RE-11						ST6	GT1 ST6 PP1								ST1 ST6	ST1 ST4 ST6				

Learning outcomes		Integral competence	Competencies																		
			General competencies							Special (professional) competencies										Additional special (professional) competencies	
			GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10	SC-11	SC-12
	RE-12	ST2 ST5														ST2 ST5	ST2		ST2		
	RE-13	ST1 ST3 ST4 PP1														ST1 ST3			ST4 PP1	ST1 ST3	
	RE-14	ST1 ST3 ST6 PP1			ST1 ST3 PP1													ST1 ST6 PP1		ST1	
	RE-15	ST1 ST3 ST4 PP1		ST3 PP1															ST1 ST3 PP1	ST1 ST3 ST4	
	RE-16	ST1 ST2 ST3 ST4 PP1		ST3	ST1 ST3														ST2 ST3 ST4		ST1 ST3 ST4 PP1
	RE-17	GT1 ST2 ST4			GT1					ST2											ST4
	RE-18						GT1 ST4 ST5 PP1					GT1 GT2 GT3 ST5									
	RE-19				GT3						ST4 PP1	GT2 PP1									GT2 ST4
	RE-20				ST1 ST4												ST1 ST4 PP1				

Learning outcomes		Integral competence	Competencies																		
			General competencies							Special (professional) competencies										Additional special (professional) competencies	
			GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	SC-1	SC-2	SC-3	SC-4	SC-5	SC-6	SC-7	SC-8	SC-9	SC-10	SC-11	SC-12
PH additional	RE-21			GT1 GT2	ST4		ST4 ST5												ST1 ST3		
	RE-22							ST1											ST2 ST5	ST1 ST3	
	RE-23		ST4	ST4 ST5				ST3											ST3 ST4	ST1 PP1	

