Ministry of Education and Science of Ukraine
V. N. Karazin Kharkiv National University

Educational Professional Program

(Educational Professional / Educational Scientific)

BIOLOGY

(Program's name)

Second (Master`s) level of higher education

(the first (bachelors`), the second (masters`), the third (PhD)

Academic field 09 Biology
Speciality 091 Biology and Biochemistry
Specialization

APPROVED
by the Academic Council
of the V.N.Karazin Kharkiv National University
«27» 05 2024,
protocol № 10

Entered into force by order of
«29» 05 2024 № 0114-8/82

Vice-rector for scientific and pedagogical work

Oleksandr HOLOVKO

Kharkiv, 2024

LETTER OF AGREEMENT
educational and professional program BIOLOGY
of the second (Master's) level of higher education

1. Scientific and Methodological Council of V. N. Karazin Kharkiv National University protocol № 8 out of 28.05 2024.

Chairman of the Scientific and Methodological Council of the University, Vice-Rector for Educational and Methodological Work _____ (Oleksandr HOLOVKO)

2. Academic Council of the School of Biology: protocol № 4 out of February 29 2024 p.

Chairman of the Academic Council _____ (Yurii GAMULYA)

3. Scientific and Methodological Commission of the School of Biology: protocol № 6 out of February 28 2024 p.

Chairman of the Scientific and Methodical Commission _____ (Olha TAHLINA)

4. Department of Biochemistry: protocol № 8 out of February 27 2024 p.

Head of the Department _____ (Kristina SEDOVA)

5. Department of Botany and Plant Ecology: protocol № 2 out of February 08 2024 p.

Head of the Department _____ (Alla HROMAKOVA)

6. Department of Genetics and Cytology: protocol № 12 out of February 28 2024 p.

Head of the Department _____ (Liubov ATRAMENTOVA)

7. Department of Zoology and Animal Ecology: protocol № 13 out of February 27 2024 p.

Head of the Department _____ (Tetiana ATEMASOVA)

8. Department of Molecular Biology and Biotechnology: protocol №8 out of «07» February 2024..

Head of the Department _____ (Anatolii BOZHKOV)

9. Department of Mycology and Phytoimmunology:
protocol № 7 out of February 15 2024 p.

Head of the Department _____ (Oleksandr AKULOV)

10. Department of Human and Animal Physiology:
protocol №2out of « 27 » February 2024.

Head of the Department _____ (Tetiana BONDARENKO)

11. Department of Physiology and Biochemistry of Plants and Microorganisms:
protocol № 13 out of February 05 2024 p.

Head of the Department _____ (Andrii SCHOGOLEV)

12. Guarantor of the educational program _____ (Olga UTEVSKA)
(підпис)

PREFACE

Developed by a working group consisting of:

Name	Job title, position	Scientific degree, academic title
The head of the working group, the guarantor of the educational program		
Olga Utevska	School of Biology, Professor of the Cytology and Genetics Department, Professor of the Botany and Plant Ecology Department	D.Sc., Professor
Members of the working group		
Serge Utevsky	School of Biology, Professor of the Zoology and Animal Ecology Department	D.Sc., Professor
Viktoria Komarista	School of Biology, Associate Professor of the Botany and Plant Ecology Department	PhD, Docent
Olena German	School of Biology, Associate Professor of the Cytology and Genetics Department	PhD

The following are involved in designing the educational program:

Representatives of applicants for higher education:

Vladyslav Siransky	Master student (2023-2024)	

Employers' representatives:

Lubov Kobyzeva	Employer, director of the Institute of Plant Breeding named after V.Ya. Yuryev of the National Academy of Sciences	Doctor of Agricultural Sciences, Senior Researcher, Corresponding Member of the National Academy of Sciences
Vitalij Popov	Employer, Director of Agrogen Novo LLC	Candidate of biological sciences, docent
Olexandr Rudas	Employer, general director of the LLC "Bestran Research and Production Company"	Candidate of technical sciences

The project development takes into account:

- requirements of the Standard of Higher Education of Ukraine: the second (Master's) level of higher education, academic field 09 - Biology, specialty 091 – Biology and Biochemistry (approved by the Order of the Ministry of Education and Science of Ukraine № 1458 of 21.11.2019);
- requirements of the Professional Standard for the group of professions "Teachers of higher education institutions" (approved by the Order of the Ministry of Economic Development, Trade and Agriculture of Ukraine № 610 from 23.03.2021);

- materials of the International Union of Biological Sciences, http://www.iubis.org/;
- materials of publications of the Journal of Biological Education, https://www.tandfonline.com/toc/rjbe20/current);

Recommendation letters of external stakeholders:

1. Oleksiy Humovsky, Doctor of Biology, Head of the Department of Entomophagous Systematics and Ecological Bases of the Biomethods, I. I. Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine

1. The profile of the Educational Program BIOLOGY

specialty 091 Biology and Biochemistry

1 – General information	
Higher Education Institution and Structural Unit	V. N. Karazin Kharkiv National University, School of Biology
Official name of the Educational Program	Biology
Higher Education Level	Second (Masters') level of Higher Education
Qualification	Master of Science, specialization in Biology
Type of Diploma and Curriculum volume	Master's diploma, single, 90 ECTS credits, period of study - 16 months
Accreditation	Accredited by Ministry of Education and Science of Ukraine for the Second (master) level, УД 21016935, actual to 01.07.2024.
Eligibility Criteria	Bachelor's/ Specialist`s / Master`s degree. Applicants should have a legal education document. Selection is carried out on a competitive basis according to the University's admission rules.
Language(s) of teaching	Ukrainian, English
Period of validity of the Program	16 months
Internet address of permanent hosting of curriculum description	http://start.karazin.ua/programs/7/2/091/1 http://biology.karazin.ua/study-master-ukr.html
2 – The goals of the Educational Program	
Advanced training in fundamental and practical biology: training of professionals capable of solving complex specialized tasks and practical problems in biology and professionals in teaching with applying of theories and methods of natural sciences. Training of students with a special interest in scientific research and teaching for further studies at the third (educational and research) level of education. Preparing staff for research organizations. Training of teachers of biological disciplines for higher education organizations.	
3 - Description of the Educational Program	
Subject area (academic field, specialty, specialization)	Academic field 09 – Biology Specialty 091 – Biology and Biochemistry
Orientation of Educational Program	Educational and Professional
Focus of Educational Program and specialization	Advanced special education in the specialty "Biology and Biochemistry": - study of the structure, functions and life processes of biological systems at different levels of organization, the regularities of onto- and phylogenetic processes and ecosystem dynamics; biodiversity and evolution of living systems, their interaction with the environment, reactions under different conditions; the importance of living beings for the biosphere, national economy, health care; - training in methods of laboratory and field biological research, monitoring, bioinformatics, mathematical and statistical processing of experimental data, interpretation of the research results, information and communication technologies, methods of empirical research and modeling of life processes of biological systems; - acquiring skills for working with living objects, biological models, modern equipment for laboratory and field biological research, databases, specialized software and computer tools. Key words: biology, biochemistry, genetics and cytology, human and animal physiology, bioecology and botany, zoology and animal ecology, physiology and biochemistry of plants and microorganisms, mycology and

	phytoimmunology, molecular biology and biotechnology, evolution, phylogenetics.
Distinctive features of Educational Program	The educational program proposes classic blocks of elective disciplines (bioecology and botany, zoology and animal ecology, biochemistry, etc.), which provide an in-depth study of biodiversity and mastering the methods of field, laboratory and bioinformatic research. The EP is the only one in Ukraine that provides a block of elective disciplines in mycology and phytopathology, as well as special courses - DNA barcoding, molecular evolution and phylogenetics as integrative disciplines that combine different branches of modern biology. At the same time, applicants are offered a choice of modern disciplines that involve laboratory research methods (molecular biology and biotechnology, physiology and biochemistry of plants and microorganisms, etc.). Three additional selective blocks of the biomedical direction (biochemistry, genetics and cytology, human and animal physiology) are available to students of part-time form of education because traditionally the most of them work in medical laboratories and are interested in this choice. Obligatory educational components include disciplines aimed at training teachers of higher education institutions. This expands the employment opportunities of graduates and ensures the reproducibility of professional personnel. The EP is implemented in an active research environment. Students are involved in research work and research projects. Educational courses 'Methodology and organization of scientific research', 'Scientific research practice', 'Modern problems of biology', 'Methods of evolutionary biology', etc., aimed to train researchers capable of innovation and solving applied tasks based on the scientific research. The research environment includes Students' scientific society, annual international conference of young researchers "Biology: from the molecule to the biosphere" and other scientific conferences. The journal "Bulletin of V.N. Karazin KhNU: Biology Series" is published.
4 – Employability and further education	
Employability	Scientific and research institutions, higher education institutions of the I-IV levels of accreditation, secondary (basic) and high (profile) school. Research positions in the field of communication and management. The position of a teacher including a teacher in high schools. The list of potential professional positions for graduates includes activities in biological, biotechnological, microbiological, medical, hydrobiological, sanitary-epidemiological, ecological, and others organizations; in fishery, forestry, animal husbandry; job in diagnostic laboratories, agricultural holdings, nature reserves, scientific and higher educational institutions around the world. According to the National Classifier of Ukraine: Classifier of Professions (DK 003:2010): 2 Professionals 22 Life Sciences and Medical Sciences Professionals 221 Life Sciences and Medical Sciences Professionals 2211 Biologists, botanists, zoologists and related professionals 2211.1 Scientific employees (biology, botany, zoology, etc.) 2211.2 Biologists, botanists, zoologists and professionals in related professions 23 teachers 231 Teachers of universities and higher educational institutions 2310 Teachers of universities and higher educational institutions 2310.2 Other teachers of universities and higher educational institutions According to the International Standard Classification of Occupations 2008 (ISCO-08): 213 Life science professionals 2131 Biologists, botanists, zoologists and related professionals

	2132 Farming, forestry and fisheries advisers 2133 Environmental protection professionals
Further education	Education at the third (educational-scientific) level of higher education (8 levels of NQF, third cycle FQ-EHEA and 8 levels of EQF-LLL). Acquisition of qualifications in other specialties in the system of postgraduate education.
5 – Teaching and assessment	
Teaching and learning	Principles: student-centered learning, problem- and project-oriented learning, self-study. Forms of education: lecture, laboratory work, practical work, seminar, educational excursion, research practice, pedagogical (assistant) practice. Teaching methods: verbal (explanation, conversation, discussion; self-educating work with educational and scientific literature); observation (illustration, demonstration); practical (laboratory works; exercises; creative works; practical tasks); problem-based learning (teaching with problematic elements; problem solving in dialogue; heuristic or search method; research method). Lecture classes are problem-based, include analysis, synthesis, comparison, modeling, analogy, dialectic, abstraction, concretization, systemic, historical and logical approaches. Laboratory and practical classes are conducted in small groups, involve the use of experimental scientific research methods, statistical processing of experimental data, information and communication technologies. Educational and methodological support for self-eduction is carried out through distance learning elements: electronic lectures, methodical instructions and tasks, as well as through the participation of students in research projects. Emphasis is focused on personal self-development, which will contribute to the formation of the need and readiness to continue self-education throughout life.
Assessment	Types of control: current, final, attestation. Forms of control: - current control: oral survey; reports, presentations and speeches; defense of laboratory and individual tasks; written control (tests, individual tasks, essays); - final control: written control (tests, open questions); practice reports; - attestation: defense of qualification thesis, attestation exam. Evaluation of the educational achievements is carried out on a four-level (excellent, good, satisfactory, unsatisfactory) or two-level national scale (passed/failed); 100-point system (passing points 50...100). The University has a zero-tolerance policy for academic dishonesty. Antyplagiarism system is in place.
6 – Program Competences	
Integral competence	The ability to solve complex professional and practical problems in biology via research and innovations.
General competences (GC)	***- competencies defined by the standard of higher education in the specialty:*** GC01. Ability to work in an international and global context. GC02. Ability to use modern information and communication technology GC03. Ability to generate new ideas (creativity). GC04. Ability to act on the basis of ethical considerations and in compliance with moral and ethical norms of professional activity.

	GC05. Ability to develop and manage projects, make decisions in complex and unpredictable conditions, which requires the use of new approaches and forecasting. GC06. Ability to perform professional functions and conduct research at the appropriate level in the field of biological sciences and at the boundaries of subject areas. - competencies defined by the higher educational institution: GC07. Ability to learn throughout life: learn and analyze new information, acquire new abilities and skills.
Professional competences of specialty (PC)	***- competencies defined by the standard of higher education in the specialty:*** PC01. Ability to use the latest advances in biology necessary for professional, research and / or innovation. PC02. Ability to formulate modeling problems, create models of objects and processes on the example of different levels of living organization using mathematical methods and information technology. PC03. Ability to use modern information technologies and analyze information in the field of biology and at the boundaries of subject areas using appropriate knowledge bases and software tools. PC04. Ability to analyze and summarize the results of research at different levels of organization of living, biological phenomena and processes. PC05. Ability to plan and perform experimental work using modern methods and equipment, analyze and interpret their results. PC 06. Ability to predict the development of modern biology based on a general analysis of the development of science and technology and knowledge of modern scientific issues in the field. PC07. Ability to diagnose the state of biological systems based on the results of studies of organisms at different levels of the organization. PC 08. Ability to present and discuss the results of scientific and applied research, prepare scientific publications, participate in scientific conferences and other events. PC09. Ability to apply copyright law for practical purposes, to adhere to the norms of academic integrity. PC10. The ability to use the results of scientific research in practical activities. ***- competences defined by the higher educational institution:*** PC11. Knowledge of modern conceptions of the fundamental sciences regarding the origin, development, structure and life processes of living organisms, complex understanding of the organization of biological systems at different levels, the ability to apply knowledge to form own worldview and interpret research results. PC12. Possession of fundamental biological concepts (adaptation, ontogenesis, evolution, etc.), the ability to use it to interpret own research results. PC13. The ability to generate and experimentally test .own hypotheses regarding the connection between biological structure and function, mechanisms of biological processes and phenomena, cause-and-effect relationships in nature. PC14. Skills of reasoned discussion and communication in the field of biological sciences and interdisciplinary areas. PC15. The ability to understand information from related fields of knowledge and clarify narrowly professional issues to specialists in other fields.

	PC16. The ability to popularize biological knowledge, provide practical consultations in the field of biological sciences, defend a scientific worldview. PC17. The ability to apply the basics of pedagogy and psychology in the educational process in higher educational institutions.
7 – Program Learning Outcomes (LO)	
	- ***program learning outcomes defined by the standard of higher education in the specialty***: LO1. To know the state and foreign languages at a level sufficient for communication on professional issues and presentation of the results of their own research. LO2. To uses libraries, information databases, online resources to find the information needed to solve the problem. LO3. To carry out coordinated work for the result in the team, considering public, state and industrial interests, determine their contribution to the cause. LO4. To solve complex problems in the field of biology, generate and evaluate ideas. LO5. To analyze and evaluate the impact of biology on the development of society, provides professional advice in the field of biology. LO6. To analyze biological phenomena and processes at the molecular, cellular, organismal, population-species and biosphere levels in terms of basic general scientific knowledge, as well as using special modern research methods, including the use of appropriate equipment. LO7. To describe and analyze the principles of structural and functional organization, mechanisms of regulation and adaptation of organisms to the influence of various factors at the molecular and cellular levels. LO8. To apply during research knowledge of the peculiarities of the development of modern biological science, the basic methodological principles of scientific research, methodological and technological tools for conducting research in specialization. LO9. To plan research, choose effective research methods and their material support, apply appropriate methodological approaches and equipment. LO10. To present the results of research work in writing (in the form of a report, scientific publications, etc.) and orally (in the form of reports and defense of the report) using modern technology, argues own opinion in the scientific discussion. LO11. To carry out statistical processing, analysis and generalization of the obtained experimental data using software and modern information technologies. LO12. To use innovative approaches to solve complex problems of biology under uncertain conditions and requirements. LO13. To adhere to the basic rules of biological ethics, biosafety, biosecurity, assesses the risks of the latest biological, biotechnological and biomedical methods and technologies, identify potentially dangerous organisms or production processes that may pose a threat of emergencies; knows the basic requirements of current legislation of Ukraine on the use of biological resources. LO14. To adhere to the norms of academic integrity in the study and conduct of scientific activities, know the basic legal norms for the protection of intellectual property, use regulations and regulatory and technical documentation in the field of research.

	LO15. To be able to independently plan and implement an innovative task and draw conclusions from its results. LO16. To critically comprehend theories, principles, methods from different branches of biology to solve practical problems and problems, responsibly, based on a creative approach to make decisions in complex and unpredictable conditions that require forecasting. ***- program learning outcomes determined by the higher educational institution:*** LO17. To demonstrate and use knowledge about the basic patterns of formation, quantitative assessment and strategies for preserving biological diversity, increasing the productivity and sustainability of agroecosystems and natural ecosystems. LO18. To apply pedagogical methods sufficiently for the implementation of programs of educational disciplines by specialization in higher educational institutions. LO19. To model objects and processes in living organisms and their components using information technology. LO20. To perform methods of laboratory and field studies of biological objects using appropriate equipment; methods of observation, description, identification, analysis, classification and cultivation of biological objects; methods of mathematical and statistical processing of biological research results. LO21. To be able to provide professional advice in the field of biology. LO22. To be able to popularize biological knowledge and defend a scientific worldview. LO23. To understand the basic principles of the functioning of the international scientific community: principles of reviewing manuscripts of publications, measurement of metric indices, organization of international cooperation, submission of tender applications for grants and principles of their selection. LO24. To be able to make decisions in complex and unpredictable conditions that require forecasting, based on analysis and synthesis, considering critical comments and with a creative approach.
8 – Resource supply of Program realization	
Staff	Project group: 2 Doctors of Science (Biology), 2 Candidates of Biological Sciences (PhD). Guarantor of educational program: Olga Utevska – Doctor of Science, Professor. The program involves scientific and pedagogical staff with academic degrees and academic status. High qualification of the staff is confirmed by scientific publications, national and international trainings, work on research projects founded by national and international grants.
Material and technical support	1. Laboratories with modern research equipment: Laboratory of cultivation of animal cells and tissues, Laboratory of cellular biochemistry and molecular genetics, Molecular genetics laboratory, Laboratory of callus cultures "Morphogenesis in vitro", Laboratory of microbiology, Laboratory of aquaculture with a collection of algae cultures, Laboratory of pure fungi cultures, Laboratory of plant disease diagnostics, Laboratory of parasitology, Laboratory of aquatic organisms, Laboratory of invertebrate taxonomy, Laboratory of vertebrate genetics, Laboratory of genetics of ontogenesis. 2. Computer and multimedia equipment: auditoriums and thematic offices with multimedia equipment; computer classes, laboratories of bioinformatics and systems biology.

	3. Collections of living and fixed biological objects: collections with status of the National Heritage of Ukraine (Collection of Drosophila Lines, CWU Scientific Herbarium, CWU-MYC Scientific Mycological Herbarium); personal collections of researchers (Antarctic invertebrates, etc.); botanical garden, museum of nature, vivarium, three biological biostations. 4. Qualification work can be performed in laboratories of the Research Institute of Biology and in partner institutions, such as the Institute of Cryobiology and Cryomedicine of the National Academy of Sciences of Ukraine, the Institute of Microbiology and Immunology named after I.I. Mechnikov, Slobozhanskyi National Park, etc.
Information, teaching and methodological support	Official website of V.N.Karazin KhNU: https://karazin.ua/ School of Biology website: http://biology.karazin.ua/ Central Scientific Library: http://www-library.univer.kharkov.ua/ Electronic archive of V.N.Karazin KhNU: http://dspace.univer.kharkov.ua/?locale=uk Electronic resources include: - admission conditions and programs of entrance exams; - educational programs; - educational and work plans; - schedules of the educational process; - educational and methodical complexes of disciplines; - short annotations and work programs of educational components; - evaluation criteria; - methodical materials for laboratory and practical works, individual tasks, control and qualification works; - digitized educational literature; - video lectures and lecture texts; - timetables and contact details of teachers; - up-to-date information on the possibilities of academic mobility; - information about employment opportunities and continuing education; - news and student life, etc. Corporate mail; unlimited access to the Internet; LMS Moodle; curricula and work plans; schedules of educational process; educational and methodical complexes of disciplines; didactic materials for independent and individual work of students in disciplines; internship programs; methodical instructions on performance of individual tasks, control and qualification works; criteria for assessing the level of training.
9 – Academic mobility	
National Credit Mobility	Carried out by individual contracts of participants in the educational process. Applicants for higher education can exercise the right to academic mobility in higher education institutions and research institutions of Ukraine under agreements and the basis of an individual invitation.
International Credit Mobility	Students of higher education can exercise the right to academic mobility in higher education institutions and scientific institutions abroad based on an individual invitation, as well as under the following programs: Erasmus Mundus, the DAAD German Academic Exchange Program, the Fulbright Scholarship Program, the Open Society Institute (Washington), etc., as well as individual invitations from higher education and research institutions outside Ukraine.

Teaching foreign applicants	Foreign citizens study on a paid basis at the expense of individuals or legal entities. Distance learning is being developed and implemented. All other conditions are regulated by the Rules of Admission to the University.

2. Components of the Educational Program (EP)

2.1. The list of components of the EP

Code	Components of the EP (Educational disciplines, course projects (work), practice courses, qualification work)	ECTS credits	Final assessment
1	2	3	4
Obligatory components of EP			
General training			
OC 1.	Profession-oriented Foreign Language	3	Credit
OC 2.	Psychology and Pedagogy in Higher School	4	Credit
OC 3.	Current Global Issues	3	Credit
OC 4.	Systems Biology	5	Exam
OC 5.	Current Issues of Biology	5	Exam
OC 6.	Methodology and Organization of Scientific Research	4	Exam
Professional training			
OC 7.	Teaching methods in Higher School	4	Credit
OC 8.	Methods of Evolutionary Biology	4	Credit
OC 9.	Teaching (assistant) Practice course	5	Credit
OC 10.	Research Practice course	5	Credit
OC 11.1	Master's Degree Thesis Project	8	Credit
OC 11.2	Master's Degree Thesis (defense)	-	Attestation
OC 12	Attestation exam	-	Attestation
Total amount of obligatory components:		**50**	
Elective components of EP			
General training			
EC 1	Intellectual Property / Career Management	4	Credit
EC 2	Nature Conservation / Fundamentals of Bioethics and Biosafety	4	Credit
Professional training			
EC 3	Elective special course	4	Exam
EC 4	Elective special course	4	Exam
EC 5	Elective special course	4	Exam
EC 6	Elective special course	5	Exam
EC 7	Elective special course	5	Exam
EC8	Elective practical course	5	Credit
EC9	Elective practical course	5	Credit
The total amount of elective components:		40	
Curriculum volume:		90	

***- Catalog of elective courses**

Full-time learning			
Botany and Plant Ecology			
	SPECIAL COURSES		
EC 3	Synecology and syntaxonomy	4	Exam
EC 4	Phytososology and Coservation Biology	4	Exam
EC 5	Design and GIS analysis of ecosystem services	4	Exam
EC 6	Landscape design	5	Exam
EC 7	Botanical geography	5	Exam
	SPECIAL PRACTICAL COURSES		

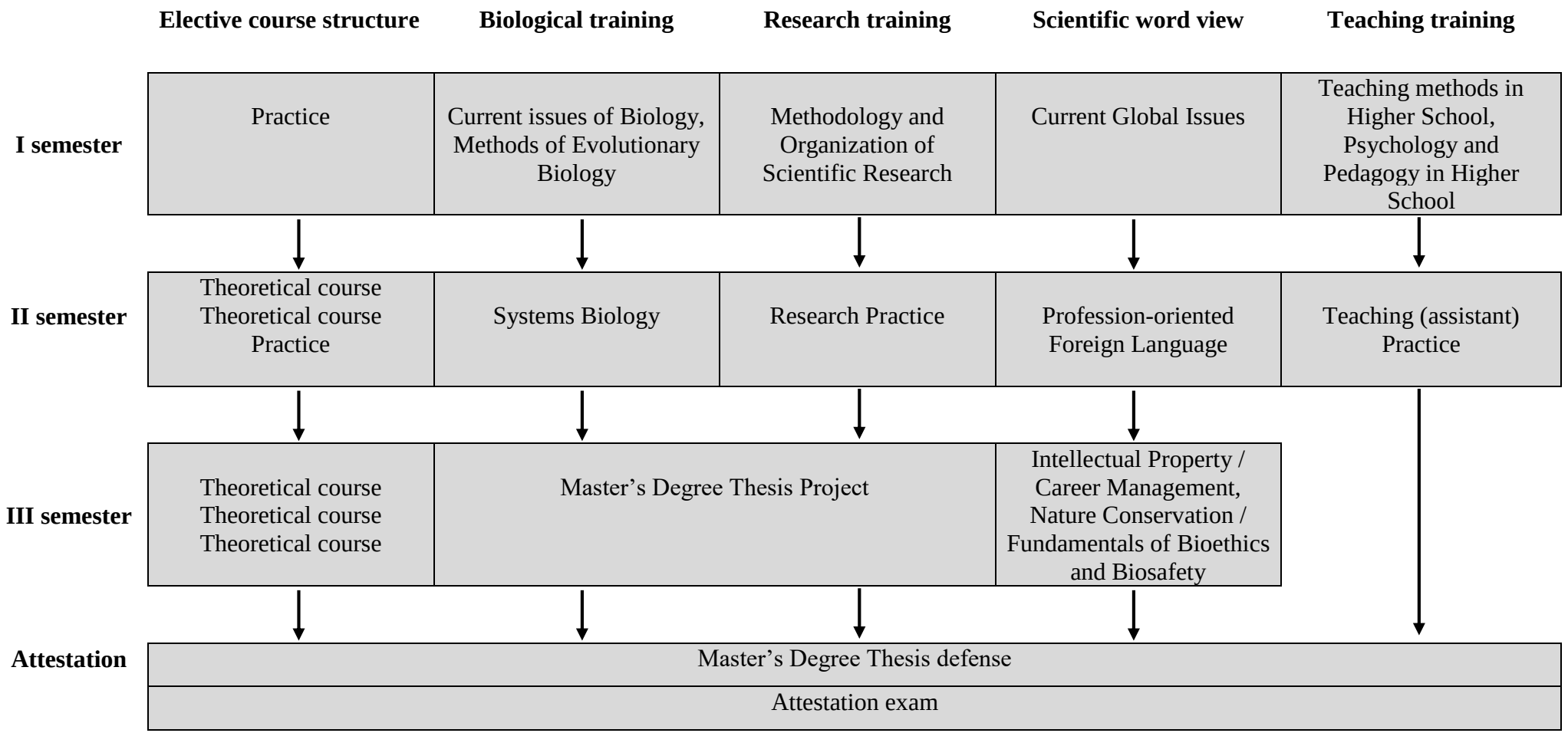
EC8	Lichenology	5	Credit
EC9	Flora of natural and synanthropic habitats	5	Credit
Zoology and Animal Ecology			
	SPECIAL COURSES		
EC3	Molecular evolution	4	Exam
EC4	Zoogeography	4	Exam
EC5	Conservation biology	4	Exam
EC6	Methods of parasitological and histological research	5	Exam
EC7	Polar ecology	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Expertise of zoological objects	5	Credit
EC9	Simulation of complex systems in biology	5	Credit
Mycology and Phytoimmunology			
	SPECIAL COURSES		
EC3	Theoretical taxonomy	4	Exam
EC4	Breeding and seed production	4	Exam
EC5	Molecular phytopathology	4	Exam
EC6	Fungi physiology	5	Exam
EC7	Fungi ecology and conservation	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Phylogeny and population genetics of fungi	5	Credit
EC9	Methods of spatial analysis in mycology	5	Credit
Molecular Biology			
	SPECIAL COURSES		
EC3	Business planning for targeted biotechnology products	4	Exam
EC4	Immunobiotechnology and cloning of animals and plants	4	Exam
EC5	Preparation and usage of callus cultures	4	Exam
EC6	Risk and biosafety of modern biotechnologies	5	Exam
EC7	Membrane technologies	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Cultivation of animal and plant cells	5	Credit
EC9	Quality control of biotechnological products	5	Credit
Physiology and Biochemistry of Plants and Microorganisms			
	SPECIAL COURSES		
EC3	Regulation of plant ontogenesis	4	Exam
EC4	Applied microbiology	4	Exam
EC5	Applied plant physiology	4	Exam
EC6	Theoretical and applied genetic engineering of plants and microorganisms	5	Exam
EC7	Mechanisms of plant-microorganism interaction with the basics of symbiogenetics	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Methods of metabolomics and signaling in plant physiology and microbiology	5	Credit
EC9	Molecular biology methods for study of physiological processes in plants and microorganisms	5	Credit

Part time learning			
Biochemistry			
	SPECIAL COURSES		
EC3	Molecular immunology	4	Exam

EC4	Biochemistry of a cell and intercellular communication	4	Exam
EC5	Cellular technologies in biochemistry	4	Exam
EC6	Bionanomaterials	5	Exam
EC7	Molecular aspects of medical biochemistry	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Research of informative biopolymers	5	Credit
EC9	Fluorescence methods in biochemistry	5	Credit
Genetics and Cytology			
	SPECIAL COURSES		
EC3	Medical genetics	4	Exam
EC4	Population genetics	4	Exam
EC5	Epigenetics	4	Exam
EC6	Genetics of microorganisms	5	Exam
EC7	Animal Genetics	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Molecular genetic expertise	5	Credit
EC9	Animal Cytogenetics	5	Credit
Botany and Plant Ecology			
	SPECIAL COURSES		
EC3	Synecology and syntaxonomy	4	Exam
EC4	Phytosozoology and conservation biology	4	Exam
EC5	Design and GIS analysis of ecosystem services	4	Exam
EC6	Landscape design	5	Exam
EC7	Botanical geography	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Lichenology	5	Credit
EC9	Flora of natural and synanthropic habitats	5	Credit
Zoology and Animal Ecology			
	SPECIAL COURSES		
EC3	Molecular evolution	4	Exam
EC4	Zoogeography	4	Exam
EC5	Conservation biology	4	Exam
EC6	Methods of parasitological and histological research	5	Exam
EC7	Polar ecology	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Expertise of zoological objects	5	Credit
EC9	Simulation of complex systems in biology	5	Credit
Mycology and Phytoimmunology			
	SPECIAL COURSES		
EC3	Theoretical taxonomy	4	Exam
EC4	Breeding and seed production	4	Exam
EC5	Molecular phytopathology	4	Exam
EC6	Fungi physiology	5	Exam
EC7	Fungi ecology and protection	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Phylogeny and population genetics of fungi	5	Credit
EC9	Methods of spatial analysis in mycology	5	Credit
Molecular Biology and Biotechnology			
	SPECIAL COURSES		
EC3	Business planning for targeted biotechnology products	4	Exam
EC4	Immunobiotechnologies and cloning of animals and plants	4	Exam

EC5	Preparation and usage of callus cultures	4	Exam
EC6	Risk and biosafety of modern biotechnologies	5	Exam
EC7	Membrane technologies	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Cultivation of animal and plant cells	5	Credit
EC9	Quality control of biotechnological products	5	Credit
Physiology and Biochemistry of Plants and Microorganisms			
	SPECIAL COURSES		
EC3	Regulation of plant ontogenesis	4	Exam
EC4	Applied microbiology	4	Exam
EC5	Applied plant physiology	4	Exam
EC6	Theoretical and applied genetic engineering of plants and microorganisms	5	Exam
EC7	Mechanisms of plant-microorganism interaction with the basics of symbiogenetics	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Methods of metabolomics and signaling in plant physiology and microbiology	5	Credit
EC9	Molecular and biological methods for study of physiological processes in plants and microorganisms	5	Credit
Human and Animal Physiology			
	SPECIAL COURSES		
EC3	Behavioral physiology	4	Exam
EC4	Basic pathophysiology	4	Exam
EC5	Molecular physiology	4	Exam
EC6	Physiology of adaptation in extreme conditions	5	Exam
EC7	Correction of endocrine pathology in experiment and clinic	5	Exam
	SPECIAL PRACTICAL COURSES		
EC8	Psychophysiological diagnostics of the functional states of the body	5	Credit
EC9	Monitoring of adaptive capacity	5	Credit

2.2. **Logic diagram of EP structure**



3. Form of certification of graduates

Form of certification of applicants for higher education in the specialty 091 "Biology" of the educational program "Biology"	Attestation is carried out in the form of public defense of qualification thesis and attestation exam. Successful certification is completed by issuing the applicant with a document of the established standard for the award of a master's degree with the award of a qualification: Master of Biology;
Requirements for the qualification thesis	Qualification thesis should involve solving a complex specialized theoretical and/or practical problem of biology with the use of fundamental principles and methods of natural sciences and systems analysis, which is characterized by complexity and uncertainty of conditions. Qualification thesis should include analysis of the current state of the problem, working hypothesis, description of applied methods and results, analysis and theoretical justification of research results. Qualification thesis must be written in a scientific style, in Ukrainian (or English). Qualification thesis should not contain academic plagiarism, fabrication and falsification. Qualification thesis must be published on the official website of the higher education institution or its subdivision, or in the repository of the higher education institution. If the thesis contains unpublished data, the abstract should be posted on the website or in the repository of the higher education institution, and the original text may be provided for review on request in the form of an application. Publication of qualification thesis containing information with limited access is carried out in accordance with the requirements of current legislation. Qualification thesis involves public defense.
Requirements for the attestation exam	The attestation exam involves assessment of learning outcomes defined by the Standard of Higher Education of Ukraine: the second (master's) level of higher education, field of knowledge 09 - Biology, specialty 091 - Biology (approved by the Ministry of Education and Science of Ukraine № 1458 of 21.11.2019) and by this educational program. The attestation exam is conducted in writing.

4. Correspondence matrix between EP competences and components

	OC 1	OC 2	OC 3	OC 4	OC 5	OC 6	OC 7	OC 8	OC 9	OC 10	OC 11	OC 12
GC 01	•		•	•		•				•	•	•
GC 02	•	•		•		•	•		•	•	•	•
GC 03		•		•		•	•	•	•	•	•	•
GC 04		•	•	•		•	•		•	•	•	•
GC 05		•		•		•	•	•	•	•	•	•
GC 06				•		•		•		•	•	•
GC 07	•	•	•	•	•	•	•	•	•	•	•	•
PC01	•	•		•	•	•	•	•	•	•	•	•
PC02				•		•		•		•	•	•
PC03	•	•	•	•	•	•	•	•	•	•	•	•
PC04		•		•	•	•	•		•	•	•	•
PC05				•		•		•		•	•	•
PC06		•	•	•	•	•	•		•	•	•	•
PC07		•		•		•	•	•	•	•	•	•
PC08	•			•		•				•	•	•
PC09		•		•		•	•		•	•	•	•
PC10		•		•		•	•	•	•	•	•	•
PC11		•	•	•		•	•		•	•	•	•
PC12		•		•	•	•	•		•	•	•	•
PC13				•		•		•		•	•	•
PC14	•	•	•	•		•	•		•	•	•	•
PC15		•	•	•		•	•		•	•	•	•
PC16		•	•	•		•	•		•	•	•	•
PC17		•					•		•			•

5. Matrix of implementation of EP learning outcomes (LO) by corresponding components

	OC 1	OC 2	OC 3	OC 4	OC 5	OC 6	OC 7	OC 8	OC 9	OC 10	OC 11	OC 12
LO01	·	·		·		·	·		·	·	·	·
LO02	·	·		·		·	·		·	·	·	·
LO03		·		·		·	·		·	·	·	·
LO04		·		·		·	·	·	·	·	·	·
LO05		·		·	·	·	·		·	·	·	·
LO06		·		·	·	·	·		·	·	·	·
LO07		·		·	·	·	·		·	·	·	·
LO08				·		·		·		·	·	·
LO09				·		·		·		·	·	·
LO10	·			·		·				·	·	·
LO11				·		·				·	·	·
LO12				·		·		·		·	·	·
LO13		·		·		·	·	·	·	·	·	·
LO14		·		·		·	·		·	·	·	·
LO15		·		·		·	·		·	·	·	·
LO16		·		·		·	·	·	·	·	·	·
LO17		·		·		·	·	·	·	·	·	·
LO18		·					·		·			·
LO19				·		·				·	·	·
LO20				·		·		·		·	·	·
LO21		·	·	·		·	·		·	·	·	·
LO22		·	·	·		·	·		·	·	·	·
LO23	·	·		·			·			·	·	·
LO24		·	·	·	·	·	·	·	·	·	·	·