НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ВОДНОГО ГОСПОДАРСТВА ТА ПРИРОДОКОРИСТУВАННЯ

Навчально-науковий інститут агроекології та землеустрою

Co-funded by the European Union

National University of Water and Environmental Engineering

05-03-56 S(E)

СИЛАБУС **SYLLABUS**	**Методологія наукових досліджень** **Methodology of scientific research**	
Шифр за ОП Code in Degree Program	ОК3	
Освітній рівень Level of Education	Магістерський (другий) Master's (second)	
Галузь знань Field of Knowledge	20	Аграрні науки та продовольство Agricultural Sciences and Food
Спеціальність Field of Study	207	Водні біоресурси та аквакультура Aquatic Bioresources and Aquaculture
Освітня програма Degree Program	Охорона, відтворення та раціональне використання гідробіоресурсів Protection, reproduction and rational use of hydrobioresources	

РІВНЕ – 2024

The Syllabus of the Educational Component "Methodology of scientific research" for Master's Degree Students of the Degree Program "Protection, Reproduction, and Rational Use of Hydrobioresources", Field of Study 207 "Aquatic Bioresources and Aquaculture". Rivne. NUWEE. 2024. 12 p.

The Degree Program (DP) on the university website: *https://ep3.nuwm.edu.ua/28749/*

Syllabus developers:
e-signature Olha Biedunkova, Doctor of Biological Science, Professor of the Department of Department of Ecology, Technologies of Environmental Protection and Forestry;
e-signature Alina Petrruk, Candidate of of Agriculture Science, Associate Professor of the Department of Water Bioresources.

Syllabus was approved at the meeting of the Department Protocol No. 18 of June 24, 2024

Head of the Department of Water Bioresources:
e-signatureTatyana Poltavchenko, Ph.D., Associate Professor.

The head of the Degree Program:
e-signatureVasyl Sondak, Doctor of Biology Science, Professor.

Approved by the Scientific and Methodological Council for the Quality of the Institute of Agroecology and Land Management (IALM) Protocol No. 23 of August 27, 2024

Head of the Scientific and Methodological Council of IALM:
e-signatureAlla Pryshchepa, Doctor of Agricultural Sciences, Professor.

The previous version of the syllabus -

PROGRAM «Methodology of scientific research»	
OVERVIEW	
Level of education Master's (second)	Level of education Master's (second)
Degree program Protection, reproduction and rational use of hydrobioresources	Degree program Protection, reproduction and rational use of hydrobioresources
Field of Study 207 Aquatic Bioresources and Aquaculture	Field of Study 207 Aquatic Bioresources and Aquaculture
Study year, semester	*1nd year 2st semester*
Number of credits	*3 ECTS credits*
Lectures:	*16 hours*
Practical classes:	*14 hours*
Independent work:	*60 hours*
Form of education	*full-time/part-time*
Type of Summative Assessme	*Test*
Language of instruction	*Ukrainian*

INFORMATION ABOUT THE UNIVERSITY TEACHER	
Lecturer 	*Olha Oleksandrivna Biedunkova* *Doctor of Biological Science, Professor of the Department of Department of Ecology, Technologies of Environmental Protection and Forestry*
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INFORMATION ABOUT THE EDUCATIONAL COMPONENT

Goals and tasks

The purpose of studying the discipline «Methodology of Scientific Research» is for students to learn the basics of conducting scientific research in the field, the basics of the strategy of obtaining and processing research results and keeping documentation, the basics of research methodology, as well as writing reports and scientific publications. The discipline is closely related to the knowledge of statistical research methods. As a result of studying the discipline, the student will know the basics of the theory and practice of scientific research in fish farming, the basics of documentation, data processing, reporting and writing scientific articles, the basics of research methods in ichthyology, fisheries and aquaculture; be able to use correlation and regression analysis to process the received data, determine the reliability of the results, analyze scientific publications on the research topic, compare and summarize the received data and data from the scientific publications of other researchers; to use the obtained data to write a master's qualification thesis.

Link to the course on Moodle

https://exam.nuwm.edu.ua/enrol/index.php?id=859

Course prerequisite and corequisite information (within the Degree Programme)

Theoretical foundations of fish farming; World fisheries. Protection and reproduction of hydrobioresources; The theory of fish population dynamics.

Competencies

GC1. Ability to use information and communication technologies.
GC2. Ability to search, process and analyze information from various sources.
GC3. Ability to abstract thinking, analysis and synthesis.
GC4. Ability to make informed decisions.
GC5. The desire to preserve the natural environment.
GC6. Ability to learn and master modern knowledge.
PC2. Ability to integrate knowledge and solve complex problems of aquatic bioresources and aquaculture in broad or multidisciplinary contexts.
PC8. Ability to analyze the world market of aquaculture products and organize state support, international cooperation in the field of fish farming and fisheries.
PC10. The ability to clearly and unambiguously convey one's own knowledge, conclusions and arguments on the problems of aquatic biological resources and aquaculture to specialists and non-specialists, in particular to people who are studying.

Program learning outcomes (LO)*

LO1. Have specialized conceptual knowledge that includes modern scientific achievements in the field of aquatic bioresources and aquaculture and is the basis for original thinking and conducting research.
LO5. Develop and implement scientific and applied projects on the problems of aquatic bioresources and aquaculture and related interdisciplinary projects taking into account production, legal, economic and environmental aspects.
LO10. The ability to preserve the sustainable development of aquatic ecosystems, to develop and implement measures to increase fish productivity, as well as the biodiversity of ichthyocenoses of the river-lake network.
LO11. To determine the cenotic changes in the composition of the populations of aboriginal ichthyofauna that occur depending on the influence of anthropogenic and climatic factors in the subsystems of the basins of natural water bodies.
LO12. The ability to calculate and implement compensatory nature protection measures for the preservation and reproduction of the composition of red book and commercial fish species in the river and lake network and the preservation of natural sites.

The structure and content of the educational component

Content module 1

Topic 1. Introduction to scientific research in the field of aquaculture and aquatic bioresources (2 hours): *General features of modern aquaculture. Overview of the history of aquaculture. Modern world leaders in aquaculture. Types and objects of aquaculture research. Challenges of aquaculture.*
Questions for independent study (8 hours):*Environmental consequences that may arise as a result of the intensive development of aquaculture. Technologies implemented to preserve biodiversity in aquaculture. Impact of climate change on the efficiency of aquaculture. What disease control methods are used in aquaculture. The role of genetic research in the improvement of species grown in aquaculture.*
LO:*LO1. LO11.*
Literature:*[1], [4], [5], [12], [14].*

Topic 2.Methods of scientific research: classification and evaluation of methods in fish farming and aquaculture (2 hours): *Methods and forms of scientific research. Observation and experiment as the main methods of knowing reality. Organizational principles of scientific fisheries research. Peculiarities of scientific research planning. Methodological and metrological support of scientific research.*
Questions for independent study (8 hours):*The impact of environmental changes on the results of scientific research in fish farming. Importance of automation and digital technologies for fish farming. Criteria for choosing research methods in aquaculture and water bioresources.*
LO:*LO1, LO5.*
Literature:*[1], [4], [6], [9].*
Topic 3.Experimental design in aquaculture. Development and analysis of observations (2 hours):*The concept of experiment and modeling. Fixation of observation results. Classification of measurements and their errors. Peculiarities of conducting and analyzing an experiment in fish aquaculture.*
Questions for independent study (8 hours):*Data processing technologies for analyzing the results of scientific research in fish farming. Implementation of the latest biotechnologies for the preservation of fish ichthyocenoses of the lake-river network and red book species. International standards that should be taken into account when conducting scientific research in fish farming and aquaculture. The impact of financing on the choice of methods and organization of scientific research in the field of fish farming.*
LO:*LO5. LO10. LO12.*
Literature:*[4], [5], [15].*
Topic 4. Statistical analysis of data in fish farming and aquaculture: basics of biometrics (2 hours):*Subject and basic concepts of biometrics. The concept of variability. Average values and their properties. Variation series. Statistical relationships between the investigated features.* ***Questions for independent study(8 hours):****Computer programs used for statistical analysis of data in fish farming and aquaculture. The influence of genetic variability on the results of biometric research. Data visualization methods for representing variation series in aquaculture research. Taking into account seasonal changes in the habitat of fish in the process of statistical analysis of the obtained data. Types of statistical errors.* ***LO:****LO5, LO11, LO12.*
Literature:*[2], [3], [10], [11].*

Content module 2

Topic 5. Ethical aspects of scientific research in fish farming and aquaculture (2 hours):*Definitions and general ideas about bioethics. Use of living organisms, ethics and safety. Laboratory biosafety of research in aquaculture. Bioprotection in aquaculture. Biorisk management system and legislation.*
Questions for independent study (8 hours):*Possible risks and ways to reduce them in the context of genetically modified species. Basic international norms and recommendations for the protection of animals in scientific research. Occupational hygiene and personal protective equipment when working in the laboratory.*
LO:*LO1, LO5.*
Literature:*[5], [13].*

Topic 6. Collection and analysis of data on aquatic biological resources: methods of monitoring and assessment of biodiversity (2 hours): *The specificity of data for the analysis of the state of aquatic biological resources. Study of the fish population structure. Determination of fish growth. Determining the age of fish. Determination of the sex of fish. Study of hydrobionts of water bodies. Presentation and initial processing of field materials. Other experimental observations of aquatic biological resources.*

Questions for independent study (6 hours):*Basic methods for collecting data on the state of aquatic biological resources. Determining the structure of fish populations in reservoirs. Determining the age of fish by otoliths. Approaches used to study hydrobionts in different types of water bodies. Presentation and initial processing of field materials after experimental observations.*

LO:*LO10, LO11, LO12.*

Literature:*[1], [5], [15].*

Topic 7.Development of scientific projects in aquaculture: basics of project planning and management (2 hours):*Integration of project management into organizational processes. Stages of project activity. Specifics of project management in aquaculture. Material, technical and financial support of scientific projects in aquaculture.*

Questions for independent study (8 hours):*Planning methods used for effective management of scientific projects. Risk assessment in scientific projects. Criteria for evaluating the success of scientific Team management methods used to increase productivity in scientific projects.*

LO:*LO1, LO5.*

Literature:*[1], [5], [8].*

Topic 8.Approbation of research results. Structure of scientific papers and reports, review (2 hours):*Approbation of scientific results. Memoir. Scientific abstract and scientific theses. Scientific report. Scientific report. Monograph. Review.*

Questions for independent study (8 hours):*Methods used to present scientific results at international forums and symposia. The importance of peer review of scientific works in the process of approbation of research results. The role of scientific seminars and round tables in approbation of scientific achievements.*

LO:*LO1, LO5.*

Literature:*[1], [7], [9].*

Topics of practical work:

1. *Fundamental and applied scientific research* ***(2 hours)***
2. *Terms and definitions in scientific research* ***(2 hours)***
3. *Methods of calculating average values* ***(2 hours)***
4. *Mode and median as methods of statistical analysis in aquaculture* ***(2 hours)***
5. *Indicators of diversity: determination of the degree of variability of a variable trait* ***(2 hours)***
6. *Study of connections between signs. Calculation of the correlation coefficient for large and small samples by quantitative characteristics* ***(2 hours)***
7. *Assessment of the state of the aquatic environment by the fluctuating asymmetry of ichthyofauna representatives* ***(2 hours)***

Teaching methods

Traditional and innovative methods, learning and teaching technologies are used.
Verbal and informative and visual and demonstrative methods: explanations, presentations, interactive interaction, discussion.
Analytical Methods: Students study scientific articles and books to expand their understanding of specific aquaculture problems or aquatic bioresource processes.
Inductive methods: during practical work, students search for dependencies between the studied parameters.
Independent work: Internet search systems and applied computer programs are used in the context of independent work.
Applicants can receive individual consultations, recommendations and informational resources to improve skills and knowledge, or perform tasks of a scientific and research nature.

Tools, equipment, software

Teaching aids: *Multimedia support, information and communication systems, computer equipment.*
Software and information support: *MS Windows, access to the Internet, educational platform Moodle, library fund and digital repository of NUWEE.*

The procedure for evaluating program learning outcomes/learning outcomes

To achieve the goals and objectives of the course, applicants need to learn theoretical material and pass modular knowledge tests, as well as timely complete and defend practical work. Forms of control in the section of the course include: an oral survey, checking reports on the implementation of practical work; computer testing.
As a result, you can get the following mandatory points: 60 points – for the timely completion and defense of practical work and other current tasks (independent work), which is the current component of the assessment; 40 points – modular knowledge tests (maximum possible score for 1 module = 20 points). Total 100 points per semester.
Module control is carried out on the Moodle platform through NNCNO. The grade is automatically generated in the Moodle environment, recorded by the teacher in the discipline's electronic journal and monitored by the dean's office.
The current evaluation and control measures within the course are carried out in accordance with the normative documents of the NUWEE: Provisions on the semester current and final control of the educational achievements of students of higher education (new edition); Procedure for liquidation of academic debts at NUWEE; Regulations on the educational and scientific center of independent assessment of the NUWEE; Order of the rector of the NUWEE №00502 dated September 16, 2019 "On the implementation of a new system for evaluating students' educational achievements". Access to the relevant local normative documents regulating the organization of the educational process of the NUWEE (with the latest changes and additions) can be found at the following link:https://nuwm.edu.ua/sp/dokumenti

Bibliography (primary, secondary)

Basic literature

1. Antoniuk V. S., Polonskyi L. H., Averchenkov V. I., Malakhov Yu. A. Methodology of scientific research: study guide. K.: NTUU "KPI", 2015. 274 p.

2. Vasylkiv I. M. Basics of probability theory and mathematical statistics: a study guide. Lviv: LNU named after Ivan Franko, 2020. 184 p.
3. Герич М. С., Синявська О. О. Математична статистика : навч. посібник. Ужгород : ДВНЗ УжНУ. 2021. 146 с.
4. Hrynevych N. Ye., Zharchynska V. S., Sliusarenko A. O., Khomiak O. A., Danylian O. H., Dzoban O. P. Methodology of scientific research: a textbook. Kharkiv: Pravo, 2019. 368 p.
5. Ievtushenko M. Yu., Khyzhniak M. I. Methodology of scientific research in fish farming. K.: Center for educational literature. 2018. 296 p.
6. Kotlovyi S. A., Pavlyk N. P., Seiko N. A., Sytniakivska S. M. Methodology of scientific research. Educational and methodological manual. Zhytomyr: Publishing House of Zhytomyr Ivan Franko State University, 2023. 89 p.
7. Martyniuk O. M. Academic writing (lecture notes): educational and methodical edition. Lutsk: Tower, 2021. 48 p.
8. Mykytiuk P. P., Brych V. Ya., Mykytiuk Yu. I., Trush I. M. Project management: a textbook. [for students of higher educational institutions]. Ternopil, 2021. 416 p.Project management: a textbook. [for students of higher educational institutions]. Ternopil, 2021. 416 p.
9. Iurynets V. Ye. Methodology of scientific research [electronic resource]: study guide. Lviv: Lviv Ivan Franko State University, 2011. 178 p. URL: http://elib.chdtu.edu.ua/e-books/4042 (дата звернення: 11.06.2024).

Additional literature

10. Tkachenko O. V. Mathematical methods in biology: methodical recommendations for students of natural sciences, Chernihiv : NUChK, 2020. 93 p.
11. Chepur S. S. Biometrics: methodical guide. Uzhhorod: Hoverla, 2015. 40 p.
12. Einarsson Á., Óladóttir Á. D. Fishing and fish farming. Fisheries and Aquaculture. 2021. P. 21–50. URL: https://doi.org/10.1016/b978-0-12-821056-7.00008-1 (дата звернення: 17.06.2024).
13. Jirkof P., Schmutz J. B. Social and organizational factors affecting biosafety compliance in animal facilities: An integrative analysis of safety rules within the system. Safety Science. 2019. Vol. 118. P. 538–550. URL: https://doi.org/10.1016/j.ssci.2019.05.053 (дата звернення: 11.05.2024).
14. Houessou A. M. et al. Market opportunities seizing capability and fish farming firm performance: A dynamic managerial capability perspective. Heliyon. 2023. Vol. 9, no. 8. P. e19019. URL: https://doi.org/10.1016/j.heliyon.2023.e19019 (дата звернення: 14.05.2024).
15. Trach Y., Chernyshev D., Biedunkova O., Moshynskyi V., Trach R., Statnyk I. Modeling of Water Quality in West Ukrainian Rivers Based on Fluctuating Asymmetry of the Fish Population. Water 2022(14). P. 3511. DOI https://doi.org/10.3390/w14213511

Methodological support

1. 05-03-132MBiedunkova O. O.(2024)*Lecture Notes on the Academic Discipline «Methodology of scientific research» for Students of Higher Education of the Second (Master's) Level in the Educational and*

Professional Program "Protection, Reproduction, and Rational Use of Hydrobioresources", Field of Study 207"Aquatic Bioresources and Aquaculture" of Full-Time and Part-Time Education (in Ukrainian) Access mode: https://ep3.nuwm.edu.ua/30443/

2. 05-03-133MBiedunkova O. O.(2024)*Methodological Instructions for the Implementation of Practical Work in the Academic Discipline «Methodology of scientific research» for Students of Higher Education of the Second (Master's) Level in the Educational and Professional Program "Protection, Reproduction, and Rational Use of Hydrobioresources", Field of Study 207"Aquatic Bioresources and Aquaculture" of Full-Time and Part-Time Education (in Ukrainian) Access mode:https://ep3.nuwm.edu.ua/30444/*
3. 05-03-161MBiedunkova O. O.(2024)*Test Tasks for the Current Knowledge Control in the Academic Discipline «Methodology of scientific research» (Content Module 1) for Students of Higher Education of the Second (Master's) Level in the Educational and Professional Program "Protection, Reproduction, and Rational Use of Hydrobioresources", Field of Study 207"Aquatic Bioresources and Aquaculture" of Full-Time and Part-Time Education (in Ukrainian) Access mode:https://ep3.nuwm.edu.ua/30451/*
4. 05-03-162MBiedunkova O. O.(2024)*Test Tasks for the Current Knowledge Control in the Academic Discipline «Methodology of scientific research» (Content Module 2) for Students of Higher Education of the Second (Master's) Level in the Educational and Professional Program "Protection, Reproduction, and Rational Use of Hydrobioresources", Field of Study 207"Aquatic Bioresources and Aquaculture" of Full-Time and Part-Time Education (in Ukrainian) Access mode:https://ep3.nuwm.edu.ua/30452/*

Information resources on the Internet

1. *State Fisheries Agency of Ukraine.* URL: https://darg.gov.ua/
2. *Institute of Fisheries of the National Academy of Sciences of Ukraine.* URL: http://naas.gov.ua/
3. *Food and Agriculture Organization of the United Nations (FAO) – Aquaculture.* URL: https://www.fao.org/fishery/en/aquaculture
4. *World Aquaculture Society (WAS).* URL: https://www.was.org/
5. *Global Aquaculture Alliance (GAA).* URL: https://www.globalseafood.org/
6. *EndNote. Reference management software that helps researchers manage bibliographies, citations, and references for academic papers.* URL: https://endnote.com/
7. Wolfram Alpha. An online computing system that provides solutions to mathematical problems, including calculus, algebra, and differential equations, as well as statistical analysis and data interpretation. URL: https://www.wolframalpha.com/examples/science-and-technology/earth-sciences

Combination of learning and research* (if needed)

During their studies, students have the opportunity to participate in departmental scientific research on fisheries and aquaculture issues, with subsequent presentation of results at All-Ukrainian student scientific work contests, and in scientific publications, particularly in the NUWEE Bulletin, as well as at round tables and conferences at the university, regional, and all-Ukrainian levels. The requirements for participation and submission of works can be found on the student scientific work sector page https://nuwm.edu.ua/naukovadijaljnistj/stud-science
Students pursuing higher education are involved in research on various fish species to obtain initial data for practical classes. This also applies when selecting a topic for their qualification work or including specific sections in it, in accordance with the course topic.

TEACHING AND LEARNING POLICIES

List of social, "soft" skills (soft skills)

Analytical skills and scientific communication; Collaboration and teamwork; Ability to self-organize; Critical thinking.

Deadlines and rescheduling

The deadlines for passing the intermediate control modules and the final control (credit) are established according to the Regulation on semester current and final control of educational achievements of students of higher education (new edition). The resubmission of test tasks for checking the assimilation of theoretical material is carried out in accordance with the rules of the National Academy of Sciences and the Procedure for the Liquidation of Academic Debts at the NUWEE. In the case of student disagreement with the evaluation results, students have the right to act in accordance with the Procedure for appeals by applicants for higher education and other persons studying at NUWEE, which provides for the filing of an appeal, after which the appeal commission is convened. The organization of all types of educational activities within the course is carried out in accordance with the Regulations on the Organization of the Educational Process at the NUWEE. In cases of detection of plagiarism while completing the task, the applicant does not receive points and must complete the task again, according to the Regulation on detection and prevention of academic plagiarism at the NUWEE (new edition).
Access to the relevant local regulatory documents of the NUWEE (with the latest changes and additions) is available at the link: https://nuwm.edu.ua/sp/dokumenti

Non-formal and informal education (if needed)

The applicant has the possibility of recognition (re-enrollment) of the results of studies in terms of the subject of the academic discipline, which he acquired in non-formal and informal education, according to the Regulations on informal and informal education at the NUWEE http://surl.li/mkhzw
The corresponding number of hours can be credited to the applicant as a result of his successful completion of an open online course on the topic of the discipline. For this, the applicant must present a confirming document (certificate) about the successful completion of the online course.

Rules of academic integrity

The organization of all types of educational activities during the mastery of the academic discipline is carried out in accordance with the Regulations on the Organization of the Educational Process at the NUWEE. In cases of detection of plagiarism while completing the task, the applicant does not receive points and must complete the task again, according to the Regulation on detection and prevention of academic plagiarism at the NUWEE (new edition). Applicants must adhere to the Code of Honor of the students of the NUWEE, and the teacher must adhere to the Code of Honor of scientific, scientific-pedagogical, pedagogical workers of the NUWEE.
More materials on compliance with the principles of academic integrity: the website of the National Agency for Quality Assurance of Higher Education https://naqa.gov.ua/; "Quality of Education" page of NUWEE http://nuwm.edu.ua/sp

Attendance requirements

Lectures and practical classes, as well as consultations are held according to the schedule in offline or online mode. If necessary, at a time agreed with the students. Attending classes is a mandatory component of education.

Автор
Професор Ольга БЄДУНКОВА

Затверджено

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