**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

# 05-03-63S (E)

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| **СИЛАБУС**<br><br>**SYLLABUS** | **Інтегрована мультитрофічна аквакультура**<br>**Integrated multi-trophic aquaculture** | |
| Шифр за ОП<br>Code in Degree Programme | ВК.2 | |
| Освітній рівень<br>Level of Education | Магістерський (другий)<br>Master's (second) | |
| Галузь знань<br>Field of Knowledge | 20 | Аграрні науки та продовольство<br>Agricultural Sciences and Food |
| Спеціальність<br><br>Field of Study | 207 | Водні біоресурси та аквакультура<br>Aquatic Bioresources and Aquaculture |
| Освітня програма<br><br>Degree Programme | Охорона, відтворення та раціональне використання гідробіоресурсів<br>Protection, reproduction and rational use of hydrobioresources | |

RIVNE – 2024

The syllabus of the academic discipline "**Integrated multi-trophic aquaculture**" for master's degree students of the educational program "Protection, reproduction and rational use of hydrobioresources", specialty 207 Aquatic bioresources and aquaculture. Rivne. NUWEE. 2024. – 17 p.

Educational Program (EP) on the university website:
*https://ep3.nuwm.edu.ua/28749/*

Syllabus developer: *academic degree, academic title, and position*
Konontsev Serhii Viktorovych, Doctor of Technical Sciences, Associate Professor, Professor of the Department of Aquatic Bioresources

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

Head of the department: *Tatyana Poltavchenko, Ph.D., Associate Professor, Head of the Department of Water Bioresources.*

The head (guarantor) of the EP: *Vasyl Sondak, Doctor of Biology Science, Professor of the Department of Water Bioresources*

Approved by the scientific and methodical quality council of NNIAZ Protocol No. 2 dated “24” September 2024.

Head of the Scientific and Methodological Council for the Quality of the Institute of Agroecology and Land Management (NNIAZ):
*Alla Pryshchepa, Doctor of Agricultural Sciences, Professor, Director the Institute of Agroecology and Land Management*

The previous version of the syllabus (*specify code*) –



| PROGRAM ‹Integrated multi-trophic aquaculture› | |
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| **OVERVIEW** | |
| Level of education | *Master's (second)* |

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| Degree program | *Protection, reproduction and rational use of hydrobioresources* |
| Field of Study | *207 Aquatic Bioresources and Aquaculture* |
| Study year, semester | *2nd year III st semester* |
| Number of credits | *4,5 ECTS credits* |
| Lectures: | 24 |
| Practicals /Laboratory classes: | 22 |
| Independent work: | 89 |
| Coursework: | - |
| Form of education | *full-time/part-time* |
| Type of Summative Assessment | *credit* |
| Language of instruction | *Ukrainian* |

| INFORMATION ABOUT THE DEVELOPER | |
|---|---|
| Lecturer  | *Konontsev Serhii, Doctor of Technical Sciences, Associate Professor, Professor of the Department of Water Bioresources* |
| Wikisitet | *specified URL*: *https://cutt.ly/9QrWuMI* |
| ORCID | *specified URL*:: *https://cutt.ly/dQrQ7fQ* |
| How to communicate | *s.v.konontsev@nuwm.edu.ua* *https://exam.nuwm.edu.ua/my/* |
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| INFORMATION ABOUT THE EDUCATIONAL COMPONENT |
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| **Purpose and tasks** |

The module on "Integrated multitrophic aquaculture" is devoted to the latest technologies in the industry, which allow to ensure the sustainable growth of aquaculture while simultaneously solving the current problems of the negative impact of aquaculture on the environment and the limitation of biological resources. The purpose of the discipline is to acquaint students with the principles of growing aquaculture objects and feed organisms, plant products within a common water circuit, and to develop skills in the design and management of integrated aquaculture systems.
**The main tasks of the module**: 1. To expand knowledge about technologies for growing aquaculture objects, fodder organisms and agricultural plants in systems with circulating water supply. 2. Investigate the requirements of individual groups for environmental parameters and the conditions of their cultivation processes in the common water circuit. 3. To develop skills in calculation and design of integrated aquaculture systems with circulating water supply.

## Link to the course on Moodle

https://exam.nuwm.edu.ua/course/view.php?id=6502

## Course prerequisite and corequisite information (within the Degree Programme)

*Prerequisites are provided by the module "Intensive Technologies in Aquaculture".*

## Competencies

The module "Integrated multitrophic aquaculture" develops the following general (GC), professional (PC), and subject-specific competencies:
**GC1.**The ability to use information and communication technologies both to analyze the prospects of introducing innovations in production and to identify risks arising in the process of implementing an innovative project; justification of investment costs and the need for additional resources for the implementation of the innovation.
**GC2.** The ability to search, process and analyze information from various sources, in particular when designing, implementing modern technologies and the latest techniques in the production of aquaculture products, forecasting the main economic and production indicators of innovation.
**GC3**. Ability to abstract thinking, analysis and synthesis, including search, development and implementation of innovations that increase the efficiency of production of fish farming products, create a new product on the aquaculture market and beyond, mastering the latest technologies in fish farming.

**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 persons who are studying.

**PC11.** The ability to design technological maps and manage production processes that are complex and require new strategic approaches in the field of aquatic bioresources and aquaculture.

| Program learning outcomes (LO)* |
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| LO 1. 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.<br>LO 7. To develop, implement and apply effective technological processes of production of aquaculture products, to ensure its quality.<br>LO 13. The ability to design recirculation systems for industrial and decorative aquaculture, carry out calculations of modern technological equipment, justify the economic feasibility of the adopted technological decisions.<br>LO 15. To analyze the impact of parameters of the aquatic environment on the health of fish and to develop measures to preserve the quality of water in open reservoirs, to apply modern water purification and water treatment technologies in closed aquaculture systems, to reduce the negative impact of aquaculture on the environment. |

| The structure and content of the educational component | |
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| ***Content module 1.***<br>***Integrated multitrophic aquaculture of open aquatic systems*** | |
| **Topic 1. Social and ecological significance of modern technologies of production of aquaculture products** | |
| LO1; LO15<br>Number of hours:<br>lectures - 2.0 hour<br>Literature: 1- 5 | Global problems of aquaculture and ways to solve the shortage of raw materials and feed base. Ecological and economic foundations of the emergence of energy-saving technologies in aquaculture. The history of the development of integrated multitrophic aquaculture. |
| **Topic 2. Theoretical foundations of the organization of integrated multitrophic complexes within different forms of aquaculture** | |
| LO1; LO15<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0.<br>Literature: 2- 4, 6, 8 | Principles of organizing the processes of growing aquaculture objects in integrated multitrophic aquaculture. Aspects of the implementation of the IMTA concept in various forms of fish farms. Justification of economic and ecological feasibility. |
| **Topic 3. Biotransformation processes that occur in the IMTA circuit and the role of different groups of hydrobionts in them** | |

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| LO1; LO7; LO15<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0 hour<br>Literature: 1-5, 11 | Characterization of waste from aquaculture farms and analysis of potentially attractive groups for inclusion in an integrated aquaculture complex. |
| ***Topic 4. Criteria for selecting species of fish and plants for joint cultivation in an integrated complex*** | |
| LO7; LO15<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0 hour<br>Literature: 2-5, 10 | Analysis of the requirements of individual species and groups of hydrobionts for growing conditions within the IMTA. Criteria for the selection of IMTA facilities in sea water. Technical equipment to ensure the processes of growing additional crops. |

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| **Topic 5. Spatial succession of IMTA hydrobionts in open water bodies and ways to ensure the traffic of nutrients to specialized groups** | |
| LO1; LO7; LO15<br>Number of hours:<br>lectures - 2.0 hour<br>Literature: 1-4 | Factors affecting the efficiency of nutrient traffic to target groups of IMTA hydrobionts. Technical solutions to optimize the traffic process and minimize the loss of biogenic elements. |
| **Content module 2. Integrated multitrophic aquaculture of recirculating systems** | |
| ***Topic 6. The history of the development of aquaponics and modern principles of the organization of production processes in the system*** | |
| *LO1; LO15*<br>*Number of hours:*<br>*lectures - 2.0 hour.*<br>*Literature: 1-3, 7* | *Advantages of modern aquaponics systems in the aspect of growing high-quality food products. The influence of scientific and technological progress on the efficiency and economic component of the production cost of aquaponics systems.* |
| ***Topic 7. Plant nutrition in aquaponics and the balance of micro- and macroelements in the system*** | |
| LO1; LO7; LO13<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0 hour.<br>Literature: 1- 4, 8 | *Analysis of plant needs for macro- and microelements and potential load according to the main types of pollution from the fishing complex. The importance of limiting elements and ways of balancing the aquaponics system.* |
| ***Topic 8. Comparative characteristics of modern hydroponics systems*** | |

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| LO7; LO15<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0 hour.<br>Literature: 2, 5 | *Types of modern aquaponics systems, their classification according to the organization of water consumption. Advantages and disadvantages of different aquaponics systems.* |

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| ***Topic 9. Characteristics of substrates and features of their use in hydroponics systems*** | |
| LO7; LO13<br>Number of hours:<br>lectures - 2.0;<br>Literature: 1-4 | *Purpose of substrates in aquaponics systems. Main characteristics of substrates. Peculiarities of using different types of substrates in aquaponics.* |
| ***Topic 10. System balance maintenance "fish pond-aquaponics" at the level of composition of nutritional elements and physical and chemical indicators*** | |
| *LO7; LO13; LO15*<br>*Number of hours:*<br>*lectures - 2.0;*<br>practice – 2.0 hour .<br>*Literature: 2,4,8* | *Analysis of the need and additional nutrition of plants in aquaponics. Selection of fertilizers and rules for introducing nutrient solutions in aquaponics. Control of physical and chemical parameters in the water cycle and correction of indicators in accordance with the requirements of each IMTA block.* |
| ***Topic 11. Organization of a rational water regime and spatial succession of objects of cultivation and purification organisms in IMTA*** | |
| LO1; LO13; LO15<br>Number of hours:<br>lectures - 2.0;<br>practice – 2.0 hour.<br>Literature: 2, 4, 10, 11 | *Interrelationship between the components of the integrated aquatic system. Schematic diagrams of connected integrated complexes. Features of direct-current integrated systems. Disconnected multi-loop integrated systems.* |
| ***Topic 12. Innovative solutions in integrated aquaculture systems*** | |
| LO1; LO13<br>Number of hours:<br>lectures - 2.0<br>practice – 2.0 hour.<br>Literature: 1-5,12 | *Optimizing the use of production areas in aquaponics systems. Automated plant lighting systems in aquaponics. Modern systems of artificial lighting.* |
| **Teaching methods** | |

*Teaching is conducted through lectures (multimedia, interactive), seminars, practical work, and consultations with the instructor.*

*The forms of theoretical education include lectures and seminars. Lectures are delivered using explanatory and illustrative methods, multimedia presentations, handouts, and tables. Seminar sessions utilize methods such as oral questioning, discussions, debates, and presentations. It is proposed to discuss problematic issues, for example, "What factors must be taken into account when selecting plants for an aquaponics system?", "Can it be said that all structural elements of IMTA of closed complexes will be economically profitable?" "What additional factors can be used to confirm the expediency of implementing the IMTA concept in closed aquaculture systems."*

*The form of professional training is practical classes, which are held in a specialized laboratory of the Department of Water Bioresources, equipped with devices for electricity and water supply, containers for keeping hydrobionts (aquariums, plastic pools, bathtubs).*

*The research method is used when students perform individual tasks. Students use methodical material prepared by the teacher: presentations, lecture notes, methodical instructions for practical classes and independent work.*

*The research method is applied when students perform individual tasks. Students use methodological materials prepared by the instructor: presentations, lecture notes, and methodological guidelines for practical classes and independent work.*

*During the course, students are encouraged to participate in the department's scientific research work, prepare scientific articles, and present reports at scientific conferences and round tables.*

*Student-centered learning, problem-based learning, interactive self-learning, information technologies, the credit-transfer system of learning organization, e-learning in the Moodle system, and research and observation-based learning are all integrated into the teaching process.*

**Tools, equipment, software**

*Modern equipment of the integrated multi-trophic aquaculture laboratory: pools and trays made of polypropylene, pumping and air-blowing equipment, automatic feeders, a line for the production of extruded compound feed for fish (including the newly established integrated multitrophic aquaculture laboratory created under the AFISHE project).*

*During lectures and practical classes, a multimedia projector, a laptop, library and internet resources, Google Sheets and Google Forms (corporate subscription), study guides, monographs, and scientific and popular articles are used.*

**The procedure for evaluating program learning outcomes/learning outcomes**

*Evaluation is carried out using two grading scales (excellent, good, satisfactory, unsatisfactory) and a 100-point scale.*

***Types of assessment:*** *current and final. Students take current (modular) and final assessments at the Educational and Scientific Center for Independent Assessment of NUWEE.*

*The assessment of students' knowledge is conducted in accordance with the "System for Evaluating the Learning Outcomes of Higher Education Applicants (Semester Current and Final Control) with Amendments and Additions" (http://ep3.nuwm.edu.ua/21123).*

*Forms of assessment include: oral questioning, defense of practical work, verification of practical work reports, and computer-based testing.*

*The educational component ends with a credit, the points for practical and independent work (60 points in total) and the credit module (40 points) are added up.*

*The results of completing two module tests (20 + 20 = 40 points) during the semester can be counted as a credit result if they are completed on time and successfully*

*To pass successfully, the combined score for current and modular assessments must exceed 60 points, with a maximum of 100 points.*

*The modular control and exam will be conducted in the form of testing on the university's educational platform MOODLE.*

***Intermediate (current) assessment is conducted on the NUWEE educational platform in the form of two modules.***

***The current module control No. 1*** *consists of 24 random test tasks of three levels of difficulty: Level 1 (choose one correct answer among the proposed options): 20 x 0.5 points = 10 points; Level 2 (choose one, two, or more correct answers among the proposed options, identify an incorrect statement among the proposed ones): 3 x 2.0 points = 6 points; Level 3 (identify the name and function of a compound based on an image, solve a problem to calculate the equilibrium concentration of dissolved oxygen; identify the incorrect statement among the proposed ones): 1 x 4.0 points = 4 points.*

***The current module control No. 2*** *consists of 24 random test tasks of three levels of difficulty: Level 1 (choose one correct answer among the proposed options): 20 x 0.5 points = 10 points; Level 2 (choose one, two, or more correct answers among the proposed options, identify an incorrect statement among the proposed ones, match pairs): 3 x 2.0 points = 6 points; Level 3 (identify the incorrect statement among the proposed options): 1 x 4.0 points = 4 points.*

***The final control (exam)*** *is conducted on the NUWEE educational platform. The exam consists of 40 random test tasks of three levels of difficulty: Level 1 (choose one correct answer among the proposed options): 30 x 0.9 points = 27 points; Level 2 (choose one, two, or more*

*correct answers among the proposed options, identify an incorrect statement among the proposed ones, match pairs, solve a problem etc): 9 x 1.0 points = 9 points; Level 3 (identify the incorrect statement among the proposed options): 1 x 4.0 points = 4 points.*
*Students can earn **additional points** for the following activities:*

- *Preparing a presentation or a short report on a course-related topic – 3 point;*
- *Presenting at a scientific conference on the subject of the course, publishing theses or a scientific article – 8 points;*
- *Participating in the All-Ukrainian Student Olympiad – 5 points;*

*Participating in the All-Ukrainian Student Research Competition – 5 points.*

**Bibliography (primary, secondary)**

**Basic literature**

1. Goddek S., Joyce A., Kotzen B., Burnell G. M. Editors Aquaponics Food Production Systems: Combined Aquaculture and Hydroponic Production Technologies for the Future : Springer Nature Switzerland AG, 2019. 619 p.
2. Ridler N., Hishamunda N. Promotion of sustainable commercial aquaculture in sub-Saharan Africa: Policy framework, vol 1. Rome: FAO Fisheries Technical Paper No. 408 (1), 2001. 67 p.
3. Beyond Fish Monoculture - Developing Integrated Multi-Trophic Aquaculture in Europe / Hughes A. et al. : IDREEM Final Report, 2016. 24 p.
4. Dong S., Fang J., Jansen H.M., Verreth, J. Review on integrated mariculture in China. Workpackage: support the application of integrated multi-trophic aquaculture (IMTA) : ASEM Aquaculture Platform, 2013.
5. Vilmin L., van Duren L. A. Modeling interactions and feedbacks between Integrated Multi-Trophic Aquaculture and the receiving environment in the North and Aegean Seas [Abstract] : Aquaculture Europe, 2020.
6. Konontsev S.V. Sabliy L.A., Grokhovska Yu.R. Ecological biotechnology of wastewater treatment and cultivation of feed organisms: monograph. Rivne: NUVHP, 2011. 151 p.
7. Aquaculture. Farming Aquatic Animals and Plants / John S. Lucas, Paul C. Southgate, Craig S. Tucker : John Wiley & Sons Ltd, Third Edition, 2019. 637 p.
8. Aquaculture and Fish Farming : Cataloging-in-Publication Data Aquaculture and fish farming / Edited by Brendan Marshall : Library Press, 2017. 215 p.

**Additional literature**

9. Sabliy L.A., Korenchuk M.S., Kononstsev S.V., Grokhovska Yu.R. Implementation of the concept of an integrated multitrophic aquaculture system in freshwater fish farms with a closed water supply. *Bulletin of the Khmelnytskyi National University. Series: Technical sciences*. 2017. No. 5. P. 89-93.
10. Sabliy L., Konontsev S., Grokhovska J., Widomski M. and Lagod G. Nitrogen removal from fish farms water by Lemna minor and Wolffia arrhiza. *Proceedings Society of Ecological Chemistry and Engineering (SEChE), Proceeding of ECOpole*. Opole (Poland). 2016. Vol. 10. No. 2. R. 499-504.
11. Konontsev S. V., Sablii L. A., Kozar M. Yu., Grokhovska Yu. R. Efficiency of removal of nitrogen compounds by plants in integrated multitrophic aquaculture. *SCIENTIFIC BULLETIN OF CONSTRUCTION*. T. 91. No. 1. 2018. p. 331-335.
12. Konontcev S., Sabliy L., Kozar M., Korenchuk N. Treatment of recirculating water of industrial fish farms in phytoreactor with Lemnoideae. *Eastern-European Journal of Enterprise Technologies*. 2017. No. 5/10 (89). P. 61-67.

**Information resources on the Internet**

*13. Law of Ukraine on Aquaculture. Bulletin of the Verkhovna Rada (VVR), 2013, No. 43, Article 616. – Access mode:* https://zakon.rada.gov.ua/laws/show/en/5293-17

14. *Fish farming. Website of the Ministry of Agrarian Policy and Food of Ukraine. – Access mode: https://minagro.gov.ua/napryamki/rybne-hospodarstvo*
15. *Website of the Institute of Hydrobiology of the National Academy of Sciences - Access mode: https://hydrobio.kiev.ua/ua/*
16. *Website of the Institute of Fisheries of the National Academy of Sciences. – Access mode: http://if.org.ua/index.php/uk/.*
17. *The website of the Food and Agriculture Organization of the United Nations. Food and Agriculture Organization (FAO). – Mode of access: https://www.fao.org/*
18. *Website of the journal "Fisheries Science of Ukraine". [Electronic resource]. – Access mode: http://fsu.ua/index.php/uk/arkhiv-zhurnalu.*
19. *World Organization for Animal Health website. World Organization for Animal Health (WOAH). – Access mode: https://www.woah.org/en/home/*
20. *Schuitemaker, L. 2017. Integrated aquaculture offers potential for salmon farming. In: Salmon Business. Godvik, Norway. Cited 15 February 2022. https://salmonbusiness.com/integrated-aquaculture-offers-potential-for-salmon-farming*
21. *Megalodon. Information and analytical platform for the development of fisheries: https://fishindustry.com.ua/*

***Methodical support***

*1. 05-03-144M Konontsev, S. V. (2024) Synopsis of lectures on the educational discipline "Integrated multitrophic aquaculture" for students of higher education of the second (master's) level under the educational and professional program "Protection, reproduction and rational use of hydrobioresources" specialty 207 "Water bioresources and aquaculture" full-time and part-time education. – Access mode: https://ep3.nuwm.edu.ua/30736/*
*2. 05-03-145M Konontsev, S. V. (2024) Methodological guidelines for the implementation of practical work in the educational discipline "Integrated multitrophic aquaculture" for students of higher education of the second (master's) level under the educational and professional program "Protection, reproduction and rational use of hydrobioresources" specialty 207 "Aquatic bioresources and aquaculture" full-time and part-time education. – Access mode: https://ep3.nuwm.edu.ua/30738/*
*3. 05-03-146M Konontsev, S. V. (2024) Test tasks of the current control of knowledge from the educational discipline "Integrated multitrophic aquaculture" (content module 1) for students of higher education of the second (master's) level under the educational and professional program "Protection , reproduction and rational use of hydrobioresources" specialty 207 "Aquatic bioresources and*

*aquaculture" full-time and part-time education. – Access mode: https://ep3.nuwm.edu.ua/30741/*
*4. 05-03-147M Konontsev, S. V. (2024) Test tasks of current control of knowledge from the educational discipline "Integrated multitrophic aquaculture" (content module 2) for students of higher education of the second (master's) level under the educational and professional program "Protection , reproduction and rational use of hydrobioresources" specialty 207 "Aquatic bioresources and aquaculture" full-time and part-time education. – Access mode: https://ep3.nuwm.edu.ua/30743/*

**Combination of learning and research* (if needed)**

Graduates of higher education are involved in the implementation of scientific research topics, have the opportunity to research the processes of breeding and growing, feeding ornamental fish, treatment and prevention of diseases in laboratory conditions. In the case of choosing the topic of the graduation qualification work, or including separate sections in its content, according to the subject of the course - modern styles of aquarium design and the peculiarities of their implementation, selection work with freshwater decorative fish; during the practical work, applicants have the opportunity to obtain scientific research results for their inclusion in the qualification work.
In the educational process, the obtained individual and collective scientific achievements of the lecturer, which are related to the content of the educational component, are used:
- Modern technical equipment of decorative aquaculture;
- Cultivation of fodder organisms for the needs of decorative aquaculture;
- Prevention and treatment of diseases of ornamental fish.

**TEACHING AND LEARNING POLICIES**

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

*The components of the module contribute to the development of universal skills that enable quick adaptation to new conditions, changing fields of employment, and solving non-standard tasks in production and environmental protection: critical thinking, environmental literacy, curiosity, determination, perseverance, teamwork, responsibility, creativity, and self-directed learning for professional and personal growth.*

**Deadlines and rescheduling**

*Announcements regarding deadlines for submitting parts of the educational discipline are published on the course page on the MOODLE platform according to the calendar: https://exam.nuwm.edu.ua/calendar/view.php?view=month&course=6502*
*The deadlines for submitting intermediate control modules and the final control (exam) are established according to the Regulation on the semester's current and final control of educational achievements of higher education students. Link: http://ep3.nuwm.edu.ua/15311/.*
*Retaking of modules is carried out in accordance with the rules of the Center for Independent Assessment, announcement by the link: https://exam.nuwm.edu.ua/mod/forum/view.php?id=1.*
*Retaking of modules is allowed with the permission of the dean's office in the presence of valid reasons (e.g., medical leave).*
*Elimination of academic debt and re-study of the discipline are carried out in accordance with the "Procedure for the elimination of academic debts at NUWEE". Link: http://ep3.nuwm.edu.ua/4273/.*
*If a student disagrees with the assessment results, an appeal can be submitted to the NNIAZ dean's office on the day the test is taken, clearly stating the nature of the issue. A printed copy of all the student's answers during the attempt must be attached to the appeal. The director of the NNI convenes an appeal commission to consider the complaint, to which the student and a representative of the Center for Independent Assessment are invited, in accordance with the Procedure for appeals from students and other individuals studying at the National University of Water and Environmental Engineering http://ep3.nuwm.edu.ua/15467/.*

**Non-formal and informal education (if needed)**

*Students have the right to have their learning outcomes from non-formal and informal education credited according to the relevant regulations. http://ep3.nuwm.edu.ua/18660/. In particular, free courses on the Coursera platform. Link: https://www.coursera.org.*

**Rules of academic integrity**

*The principles of academic integrity are outlined on the NUWEE "Education Quality Department" website: https://nuwm.edu.ua/sp/akademichna-dobrochesnistj.*
*It is prohibited to cheat or discuss questions with fellow students during all control measures, including modular and final assessments. If such violations are detected, the student loses the right to continue performing tasks, which may result in a reduction of the overall grade or the failure to pass the entire course, necessitating the re-study of the educational component.*
*Information on academic integrity, plagiarism, the student honor code, etc., is provided on the website of the National Agency for Quality Assurance of Higher Education https://naqa.gov.ua/; and on the NUWEE "Quality of Education" page http://nuwm.edu.ua/sp/akademichnadobrochesnistj.*

**Attendance requirements**

*It is mandatory to make up missed classes without valid reasons (e.g., medical leave, mobility, etc.). This can be done during consultations, the schedule of which is published on the Department of Water Bioresources page: https://nuwm.edu.ua/nni-az/kaf-vb/hrafik-konsultatsii.*
*With a medical certificate or a certificate of academic mobility, the student is exempted from making up missed practical classes. Missed lectures must be independently studied by students on the educational platform on the page of the relevant educational component https://exam.nuwm.edu.ua/course/view.php?id=839.*
*During classes, students may use mobile devices only to search for information related to the module and calculators for solving tasks, except during control measures.*

Автор
Доцент Сергій КОНОНЦЕВ

Затверджено

Проректор з науково-педагогічної та навчальної роботи Валерій СОРОКА

документ підписаний КЕП
Номер документа СИЛ №1296
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Сертифікат 3FAA9288358EC003040000009B6C3700C8C2C100