Ministry of Education and Science of Ukraine
Sumy National Agrarian University
Biological and technological faculty
Department of feed technology and animal feeding

MODULE SYLLABUS

Diversification of fish farms (selective)
Implemented within the Technologies in aquaculture educational program

in specialty 204 - Technology of production and processing of animal husbandry products
at the second (master's) level of higher education

Sumy – 2024

Developer: _____ **Oleksandr MYKHALKO, associate professor of the Department of Feed Technology and Animal Feeding**

Considered, approved and approved at the meeting of the Department of Feed Technology and Animal Feeding	Minutes No10 dated 06.06.2024		
	Head department	(signature)	**Viktor OPARA** (surname, initials)

Agreed:

Guarantor of the educational program **Viktoriia VECHORKA**

Dean
Biological and technological faculty **Viktoriia VECHORKA**

A review of the work program (attached) is provided:

Mykola Povod
(Full name)

Igor Kubtzov
(Full name)

Methodist of the Education Quality Department,
licensing and accreditation V. Baranik
(Full name)

Registered in the electronic database: date:18.04.2024

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Syllabus review data:

The academic year in which changes are made	The Academic program attachment number with changes description	Changes revised and approved		
		Minutes No and date of the department meeting	Head of Department	Guarantor of the educational program

1. MODULE OVERVIEW

<table>
<tr><td></td><td>The name of the educational component</td><td colspan="6">Diversification of fish farms</td></tr>
<tr><td></td><td>Faculty/department</td><td colspan="6">Biological-technological/Forage and animal feeding technologies</td></tr>
<tr><td></td><td>Status of the educational component</td><td colspan="6">Selective</td></tr>
<tr><td></td><td>Program/Specialty (programs), the component of which is an educational component for</td><td colspan="6">Technologies in aquaculture</td></tr>
<tr><td></td><td>An educational component may be offered for</td><td colspan="6">204 Technology of production and processing of animal husbandry products
207 Aquatic biological resources and aquaculture</td></tr>
<tr><td></td><td>National Qualifications Framework level</td><td colspan="6">seventh</td></tr>
<tr><td></td><td>Semester and duration of study</td><td colspan="6">the second, 11 weeks</td></tr>
<tr><td></td><td>Number of ECTS credits</td><td colspan="6">5</td></tr>
<tr><td rowspan="4"></td><td rowspan="4">The total number of hours and their distribution</td><td colspan="6">Contact work (class)</td></tr>
<tr><td colspan="2">Lectures</td><td colspan="2">Practical/seminar</td><td colspan="2">Independent work</td></tr>
<tr><td>full-time education</td><td>external form of education</td><td>full-time education</td><td>external form of education</td><td>full-time education</td><td>external form of education</td></tr>
<tr><td>22</td><td>-</td><td>22</td><td>-</td><td>-</td><td>106</td></tr>
<tr><td></td><td>Language of education</td><td colspan="6">Ukrainian</td></tr>
<tr><td></td><td>Teacher/Coordinator of the educational component</td><td colspan="6">Mykhalko Oleksandr Gryhorovych</td></tr>
<tr><td></td><td>Contact Information</td><td colspan="6">Associate Professor of the Department of Feed Technology and Animal Feeding
office 322 of the main building
email address: snau.cz@ukr.net
consultations: every Tuesday 1400-1500.</td></tr>
<tr><td></td><td>Module description</td><td colspan="6">The discipline contributes to the formation of students in-depth professional knowledge about ways to diversify aquaculture as a whole and its individual components both at the global level and at the level of an enterprise (fish farm) in order to ensure the sustainable development of territories and ecologically oriented agriculture. The discipline ensures the development of students' ability to analyze and choose methods of diversification of territories and water areas, cultivated fish species, production systems and production cycles of aquaculture facilities, fish feeding systems, fishery products and their sales markets.</td></tr>
<tr><td></td><td>The purpose of the educational component</td><td colspan="6">Educational component:
- aimed at mastering a wide range of modern methods of fish farming diversification used in aquaculture;</td></tr>
</table>

		- allows mastering the main directions of diversification of fish farms; - studies diversification as a set of measures to optimize the rational use of natural and artificial water resources, species of fish and aquatic microorganisms, technologies and production systems; - will get acquainted with various innovative methods of production technologies of aquaculture products and the organization of its functioning. The educational component is aimed at achieving professional program competencies, which is implemented through disciplinary learning outcomes, in particular, the ability to determine the necessary direction of diversification and the possibilities of its implementation at each individual fish farm or in the region where aquaculture is conducted.
	Prerequisites for studying the educational component, connection with other educational components of the educational program	The educational component is based on the educational components "Aquaculture production technology"
	Policy of academic integrity	The policy of academic integrity at SNAU is governed by the Code of Academic Integrity http://docs.snau.edu.ua/documents/education/quality/kodeks_ akadem_dobrochesnosti.pdf In accordance with it, the requirements for the student to observe academic integrity during the study of the educational component are as follows: to be responsible for one's duties, to fulfill the tasks prescribed by the educational program on time and in good faith; to be present at all classes; perform independent work; honestly and responsibly prepare for current, modular and final control; submit for assessment only self-made work. It is unacceptable for a student to: show a disrespectful and incorrect attitude towards the teacher; being late for classes and missing them without valid reasons; during the educational process, use hints, other people's work, telephones; provide and receive assistance from third parties during current, modular and final control; receive or offer a bribe for receiving any benefits in educational activities. For violating the rules of academic integrity, students may be held liable for the following forms of responsibility: - repeated assessment (test, exam, credit, etc.); - repeated completion of the training course; − warning; - issuing a reprimand; − expulsion from the university (Part 5 of Article 48 of the Law of Ukraine "On Education");
	Link to the course in the Moodle system	https://cdn.snau.edu.ua/moodle/course/view.php?id=5708

2. LEARNING OUTCOMES BY THE EDUCATIONAL COMPONENT AND THEIR RELATIONSHIP WITH PROGRAM LEARNING OUTCOMES

Learning outcomes:	Assessment method
Disciplinary learning outcome 1. To justify the importance and impact of diversification of fish farms (farms) on the process of sustainable development of ecologically oriented aquaculture.	Essay
Disciplinary learning outcome 2. To know the general trends in the development of the latest aquaculture technologies in advanced countries of the world. To know, evaluate and apply the most effective directions of diversification in aquaculture, taking into account the peculiarities of the operation of fish farming (farms) in the region in the ecological, economic and social aspects.	Presentation, Testing
Disciplinary learning outcome 3. To implement the most effective diversification methods and techniques in the practical production activities of fish farms (farms)	Research proposal, testing

3. CONTENT OF THE EDUCATIONAL COMPONENT (CURRICULUM PROGRAM)

Topic. List of issues to be considered within the topic	Distribution within the total time			Recommended references
	Auditory work		Individual work	
	Lectures	Practical		
Topic 1. Diversification in aquaculture: A tool for sustainability 1. Introduction. Aquaculture and diversification. 2. Aquatic biodiversity used in aquaculture 3. Drivers and trends of aquaculture diversification 4. Selection of crops to grow on a fish farm 5. Choice of culture systems 6. Prospects of failures or successes of diversification 7. Responsible path to diversification 8. Examples of the use of criteria and indicators for the selection of a new species in aquaculture	**2**	**2**	**4**	**1, 2, 3, 4, 5**
Topic 2. Diversification of sites 1. Introduction 2. Justification for selecting the site 3. Choice of sites. Geographical Information Systems 4. Case study: selection of the site for a marine farm for producing Sparus aurata (gilthead sea bream), Dicentrarchus labrax (sea bass) and Argyrosomus regius (meagre) 5. Recommendation	**2**	**2**	**4**	**1, 2, 3, 4, 5**
Topic 3. Diversification of the farmed species 1. Background and justification 2. Diversification of the farmed species 3. Diversification process 4. New species 5. Integrated sole (Solea senegalensis) culture 6. Octopus (Octopus vulgaris) culture 7. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 4. Diversification of culture density 1. Background 2. Justification 3. Development 4. Conclusion 5. Case study. Production densities during the fattening phase in the ecological production of gilthead sea bream and sea bass in Mediterranean aquaculture facilities 6. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 8, 12, 13**
Topic 5. Diversification of the production systems 1. Classification of production systems of fish farms 2. Production system types based on the saline tolerance of the species	**2**	**2**	**4**	**1, 2, 3, 4, 5, 7, 10**

Topic. List of issues to be considered within the topic	Distribution within the total time			Recommended references
	Auditory work		Individual work	
	Lectures	Practical		
3. Production system types based on the organism farmed 4. Production system types based on the development phases of the species 5. Production system types based on culture density 6. Production systems based on culture location. 7. Types of facilities, based on the use of the water: open and closed circuits 8. Case study: Closed circuit 9. Recommendations				
Topic 6. Diversification in the size of the facilities 1. Introduction 2. Justification 3. Land-based facilities 4. Tideland facilities 5. Marine facilities 6. Case study: Aquaculture facility in Burriana (Castellón) 7. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 7, 11**
Topic 7. Diversification of the production cycle 1. Introduction 2. Hatcheries and nurseries 3. Fattening units 4. Integrated multi-trophic aquaculture (IMTA) 5. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5**
Topic 8. Diversification and sustainability of aquaculture nutrition 1. Actual problem with raw materials 2. Current problem with raw materials 3. Nutritional requirements of fish farmed in aquaculture 4. Case study: Nutritional and environmental evaluation of a fall in protein levels in fattening feed for the gilthead sea bream (Sparus aurata) in a marine farm located in the Mediterranean Sea. 5. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 9, 14**
Topic 9. Diversification of products 1. Background: diversification with respect to previous planning 2. Lengthening the life of the product 3. Processed and elaborated products 4. Brands (collective brands, guaranteed brands) 5. Case study: the collective brand “Crianza del Mar” 6. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 7**

Topic. List of issues to be considered within the topic	Distribution within the total time			Recommended references
	Auditory work		Individual work	
	Lectures	Practical		
Topic 10. Diversification of markets 1. Introduction and background 2. Orientation to production as opposed to market orientation 3. Differentiation of products 4. Market segmentation 5. Diversification of geographical markets 6. Diversification based on types of market 7. Identification of targets 8. Trust in products for opening up new markets 9. Case study: Norway in action in the markets 10. Recommendations	**2**	**2**	**4**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 11. Aquaculture diversification in europe: the kingdom of Spain and the Kingdom Of Norway 1. Introduction 2. Aquaculture industries in Europe 3. Aquaculture diversification in the Kingdom of Spain 4. Aquaculture diversification in the Kingdom of Norway			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 12. Aquaculture Diversification In South America: General Views And Facts And Case Studies Of The Republic Of Chile 1. Aquaculture and Aquaculture Diversification in South America 2 Aquaculture And Aquaculture Diversification In The Republic Of Chile			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Тема 12. Aquaculture And Aquaculture Diversification In The Federative Republic Of Brazil 1 Current situation and main species farmed 2 Recent history and current status of aquaculture diversification: Main drivers, constraints and species 3 The role of government, private industry and international organizations in aquaculture diversification 4 Technology and expertise, markets and institutional facilities as drivers and constraints 5 The future of aquaculture diversification: Main concerns, opportunities, restrictions, main species to consider			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 13. Diversification Of Aquaculture In North America 1. Overview 2. Changing Aquaculture Production – Regional Drivers 3. Example 1: Pacific Northwest			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**

Topic. List of issues to be considered within the topic	Distribution within the total time			Recommended references
	Auditory work		Individual work	
	Lectures	Practical		
Topic 13. Diversification Of Aquaculture In North America 1. Example 2: Northeastern Seaboard 2. Example 3: Gulf Of Mexico			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 14. Aquaculture Diversification In Asia 1. Introduction: Conceptual Starting Points 2. The Many Faces Of Diversification In Agriculture, Links To Aquaculture In Asia 3. Asian Aquaculture Case Studies 4. Preliminary Conclusions, And A Way Forward			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 15. Adaptation Of Aquaculture To Climate And External Forcing In Africa 1. Trade-Offs In Basic Production Systems 2. Species 3. Ecosystems For Aquaculture 4. Adapting To Future Change			**8**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Topic 16. Pathways For Aquaculture Diversification 1. Introduction 2. Diversification In Different Spheres 3. What are the requirements, costs and benefits of aquaculture diversification? 4. Enabling Environment For Sustainable Diversification In Aquaculture 5. Aquaculture Diversification – New Species Innovator Perspective 6. Who assumes the costs of aquaculture diversification?	**2**	**2**	**10**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10**
Усього	**22**	**22**	**106**	

4. TEACHING AND LEARNING METHODS

	Teaching methods (work to be carried out by the teacher during classroom classes, consultations)	**Number of hours**	**Study methods (what types of educational activities the student should perform independently)**	**Number of hours**
Learning outcomes 1	Educational lecture (narration, explanation, demonstration, illustration) Practical lesson (explanation, demonstration)	4	Working with lecture notes, working with books, working with regulatory and legal acts, generalization, systematization, deepening of the material, calculations, development of a civil defense plan	4
Learning outcomes 2	Educational lecture (narration, explanation, demonstration, illustration) Practical lesson (explanation, demonstration)	36	Working with lecture notes, working with books, working with regulatory and legal acts, generalization, systematization, deepening of the material, calculations, development of a civil defense plan	92
Learning outcomes 3	Educational lecture (narration, explanation, demonstration, illustration) Practical lesson (explanation, demonstration)	4	Working with lecture notes, working with books, working with regulatory and legal acts, generalization, systematization, deepening of the material, calculations, development of a civil defense plan	10

5. ASSESSMENT

5.1. Diagnostic assessment (specified as necessary)

5.2. Summative assessment

5.2.1. Intended learning outcomes methods:

№	Methods of summative assessment	Points / Weight in the overall assessment	Compilation date
1.	Essay, Topic 1	15/15%	*5th semester, 3 week*
2.	Written test, Topic 1-5	10/10%	*5th semester, 4 week*
3.	Intermediate certification, Topic 1-5	15/15%	*5 семестр, 4 week*
4.	Presentation, Topic 6-8	15/15%	*5th semester, 6 week*
5.	Written test, Topic 6-15	10/10%	*5th semester, 7 week*
6.	Research proposal, Topic 15	25/25%	*5th semester, 11 week*

5.2.2. Grading criteria

Component	Unsatisfactorily	Satisfactorily	Good	Excellent
Essay, Topic 1	*<9 points*	*9-11 points*	*12-13 points*	*14-15 points*
	Task requirements not met	Most of the requirements are fulfilled, but some parts are missing, there is no analysis of the received data	All requirements of the task have been fulfilled	All the requirements of the task were fulfilled, the obtained results were clearly interpreted, proposals were made regarding the application of diversification to increase the sustainable development of aquaculture and its consequences for the fish farm
Written test, Topic 1-5	*<5 points*	*5-6 points*	*7-8 points*	*9-10 points*
	Fewer than 6 correct answers to a test question	6-9 correct answers to the test questions	10-12 correct answers to the test questions	13-15 correct answers to the test questions
Intermediate certification, Topic 1-5	*<9 points*	*9-11 points*	*12-13 points*	*14-15 points*
	Fewer than 6 correct answers to a test question	6-9 correct answers to the test questions	10-12 correct answers to the test questions	13-15 correct answers to the test questions
Presentation, Topic 6-8	*<9 points*	*9-11 points*	*12-13 points*	*14-15 points*
	Task requirements not met	The presentation does not correspond to the content of the report, the report is not properly	The presentation corresponds to the content of the report, but the report is not	The presentation corresponds to the content of the report, but the report is properly prepared

		prepared, does not meet the requirements	properly prepared	
Written test, Topic 6-15	*<10*	*11-12*	*12-14*	*14-15*
	Fewer than 6 correct answers to a test question	6-9 correct answers to the test questions	10-12 correct answers to the test questions	13-15 correct answers to the test questions
Research proposal, Topic 15	*<13*	*14*	*15-19*	*20-25*
	Task requirements not met	The form is filled out, but the content does not meet the requirements of the topic	The form is filled out, but the research proposal is superficial, the components are not agreed	Filled out form, research proposal of an innovative nature, agreed components in detail

5.3.Formative assessment:

To assess the current progress in learning and understand the directions for further improvement is provided

№	Elements of formative assessment	Date
1.	*Survey after studying the topic*	At the next practical session after the presentation of the material on the topic
2.	*Verbal feedback from the teacher and students after the presentation of the essay*	Immediately after the end of the presentation
3.	*Verbal feedback from the teacher while working on individual tasks during classes*	At the next class after the student has completed the assignment

6. EDUCATIONAL RESOURCES (REFERENCES)

Main sources

Textbooks and manuals

1. Intensive technologies in aquaculture: teaching. manual / [R. V. Kononenko, P. G. Shevchenko, V. M. Kondratyuk, I. S. Kononenko]. - K.: "Center for Educational Literature", 2016. - 410 Sherman I.M., Yevtushenko M.Yu. Theoretical foundations of fish farming: textbook - K.: , 2011. - p
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3. FAO. 2022. The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation. Rome, FAO. 266 p. https://doi.org/10.4060/cc0461en
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Methodical support

Other sources

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2. David L. VanderZwaag, Gloria Chao. 2006. Aquaculture Law and Policy : Towards Principled Access and Operations. 577 p.
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4. Bart Holterman, 2011. The Fish Lands. German trade with Iceland, Shetland and the Faroe Islands in the late 15th and 16th Century. 531 p.
5. Odd-Ivar Lekang. 2020. Aquaculture Engineering. John Wiley & Sons, Incorporated, 526 p.
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Additional sources

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Software

https://kahoot.it/
https://www.mentimeter.com/

Modul syllabus review _____

Developed by the teacher of the Management Department Mykhalko O.G.

The parameter by which the work program (syllabus) of the educational component is evaluated	Yes	No	Comment
Learning outcomes for the educational component (MLOs) correspond to the EK			
The results of the study by the educational component (MLOs) correspond to the prescribed PLOs (for mandatory EKs)			
Learning outcomes by educational component provide an opportunity to measure and evaluate the level of their achievement			

EK project team member _____ _____ _____

(name) (surname) (signature)

The parameter by which the work program (syllabus) of the educational component is evaluated	Yes	No	Comment
General information about the educational component is sufficient			
The results of the educational component correspond to the EC			
The results of the study in the educational component correspond to the prescribed national educational requirements (for mandatory ECs)			
Learning outcomes by educational component provide an opportunity to measure and evaluate the level of their achievement			
Learning outcomes relate to students' competencies, not the content of the discipline (contain knowledge, abilities, skills, and not the topics of the discipline's curriculum)			
Educational activity (teaching and learning methods) enables students to achieve the expected learning outcomes			
The educational component involves learning through research			
The assessment strategy within the educational component is in accordance with University/faculty policy			
The provided assessment methods make it possible to assess the degree of achievement of learning outcomes by educational component			
The workload of students is adequate to the volume of the educational component			
Recommended learning resources are sufficient to achieve learning outcomes			
The literature is relevant			

Reviewer (lecturer of the department) _____ _____ _____

(name) (surname) (signature)