SEMESTER LEARNING PLAN

	NUSA CENDANA UNIVERSITY **FACULTY OF ANIMAL HUSBANDRY, MARINE AND FISHERIES** **AQUACULTURE STUDY PROGRAM**	**DOCUMENT CODE**

SEMESTER LEARNING PLAN (RPS)						
COURSES (MK)	**CODE**	**THE MK CLUSTER**	**WEIGHT (credits)**		**SEMESTER**	**Date of Preparation**
Aquaponic Aquaculture Technology	**PKPBDP12311**	**Core of the study program**	**T=2**	**P=1**	**II**	**February – 2025**
AUTHORIZATION/VERIFICATION	**RPS Development Lecturer**		**Course Coordinator**		**Study Program Coordinator**	
	Prof. Dr. Yuliana Salosso, S.Pi.MP		Prof. Dr. Yuliana Salosso, S.Pi.MP		Prof. Dr. Yuliana Salosso, S.Pi,MP	

Learning Outcomes	**PLO-Study Program Charged to the Constitutional Court**	
	PLO3	Graduates must possess the necessary skills to manage data, convey information in the field of aquaculture, and provide alternative solutions when required
	PLO6	Graduates should be able to apply science and technology to enhance productivity in aquaculture
	PLO7	Graduates should be able to identify, analyze, evaluate and interpret problems in the field of aquaculture and provide guidance in choosing various alternative solutions based on science
	Course Learning Outcomes (CLO)	
	CLO1	Understanding and Analyzing Aquaponic Systems
	CLO2	Applying Aquaculture Technology and Techniques in Aquaponics Systems
	CLO3	Evaluating and Designing Aquaponic System-Based Solutions
	Final Ability of each learning stage (Sub-CLO)	

	Sub-CLO1	Understanding the Basic Concepts of Aquaponics								
	Sub-CLO2	Analyzing Components and Design of Aquaponic Systems								
	Sub-CLO3	Managing Water Quality in Aquaponics Systems								
	Sub-CLO4	Applying Integrated Fish and Plant Cultivation Techniques								
	Sub-CLO5	Identifying and Addressing Problems in Aquaponic Systems								
	Sub-CLO6	Integrating Appropriate Technology in Aquaponic Cultivation								
	Sub-CLO7	Conducting Aquaponic Cultivation Practices Independently or in Group								
	Sub-CLO8	Evaluating the Economic and Environmental Aspects of Aquaponics								
	Correlation of Sub-CLO to CLO and PLO									
		CLO 1			CLO 2			CLO 3		Rating weight (%)
		Sub-CLO 1	Sub-CLO 2	Sub-CLO 3	Sub-CLO 4	Sub-CLO 5	Sub-CLO 6	Sub-CLO 7	Sub-CLO 8	
	PLO2	√	√							15
	PLO6			√	√	√				40
	PLO7									45
	Rating weight (%)	5	5	5	5	5	15	10		100
	Number of Weeks	1	1	2	1	1				
Brief Description of MK	This course is designed and compiled to lead students in Understanding and Analyzing Aquaponic Systems and Applying Aquaculture Technology and Techniques in Aquaponics Systems as well as Evaluating and Designing Solutions Based on Aquaponics Systems by discussing various topics, including: Introduction to Aquaponics, Types and Design of Aquaponic Systems, Components of Aquaponic Systems, Water Quality and Management, Fish Farming in Aquaponics, Plant Cultivation in Aquaponics, Aquaponics Supporting Technology, Aquaponics System Practicum, Common Problems in Aquaponics Systems, Problem Solving Strategies, Economic Feasibility Analysis of Aquaponic Systems									
Study Materials: Learning Materials	1. Introduction to Aquaponics 2. Types and Design of Aquaponic Systems 3. Components of Aquaponic Systems 4. Water Quality and Its Management 5. Fish Farming in Aquaponics 6. Plant Cultivation in Aquaponics 7. Aquaponics Support Technology 8. Aquaponics System Practicum (2 times)									

<table>
<tr><td></td><td>9. Common Problems in Aquaponics Systems
10. Problem-Solving Strategies (2 times)
11. Economic Feasibility Analysis of Aquaponic Systems
12. Environmental and Sustainability Aspects</td></tr>
<tr><td rowspan="3">Book</td><td>Main:</td></tr>
<tr><td>1. Okomoda, V. T., Oladimeji, S. A., Solomon, S. G., Olufeagba, S. O., Ogah, S. I., & Ikhwanuddin, M. (2023). Aquaponics production system: A review of historical perspective, opportunities, and challenges of its adoption. Food science & nutrition, 11(3), 1157-1165.
2. Colt, J., Schuur, A. M., Weaver, D., & Semmens, K. (2022). Engineering design of aquaponics systems. Reviews in Fisheries Science & Aquaculture, 30(1), 33-80.
3. Masabni, J., & Niu, G. (2022). Aquaponics. In Plant factory basics, applications and advances (pp. 167-180). Academic Press.
4. Hao, Y., Ding, K., Xu, Y., Tang, Y., Liu, D., & Li, G. (2020). States, trends, and future of aquaponics research. Sustainability, 12(18), 7783.
5. Connell, S. (2020). Beginner's Guide to Aquaponics: Step-by-Step Systems for Plants and Fish. Sourcebooks, Inc..
6. Yang, T., & Kim, H. J. (2019). Nutrient management regime affects water quality, crop growth, and nitrogen use efficiency of aquaponic systems. Scientia Horticulturae, 256, 108619.
7. Yavuzcan Yildiz, H., Robaina, L., Pirhonen, J., Mente, E., Domínguez, D., & Parisi, G. (2017). Fish welfare in aquaponic systems: its relation to water quality with an emphasis on feed and faeces—a review. Water, 9(1), 13.</td></tr>
<tr><td>Supporter</td></tr>
</table>

	1. Tija, U**., Salosso, Y.,** & Pasaribu, W. (2024). Growth and Survival of Tilapia (Oreochromis niloticus in Aquaponic Systems With Different Plant Species. *International Journal of Integrated Science and Technology*, *2*(12), 1040-1050. 2. Taufikurahman, T., Astutiningsih, N. T., Ulfa, N. S., Aliyyatussaadah, I., & Izzurahman, T. (2024, September). Enhancing aquaponic cultivation in Indonesia: A comparative study of bioball biofilters with different additives. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1388, No. 1, p. 012034). IOP Publishing. 3. Pinho, S., Leal, M. M., Shaw, C., Baganz, D., Baganz, G., Staaks, G., ... & Monsees, H. (2024). Insect-based fish feed in decoupled aquaponic systems: Effect on lettuce production and resource use. *Plos one*, *19*(1), e0295811. 4. Khalil, A. H., Badrey, A. E., Harabawy, A. S., Ibrahim, A. T. A., Kloas, W., & Osman, A. G. (2023). Impact of polyculture in aquaponics on the hemato-serological and health status of Nile tilapia (Oreochromis niloticus) and carp (Cyprinus carpio). *Egyptian Journal of Basic and Applied Sciences*, *10*(1), 410-419. 5. Sanam, R. G., Santoso, P., & Lukas, A. Y. (2022). Fluctuations in NH3 concentration in catfish cultivation of floating aquaponics systems using kale plants. *Aquatic Journal*, *5*(2), 160-164. 6. Pratiwi, M. R., Andayani, S., & Firdaus, M. (2022). The use of romain lettuce (Lactuca sativa L.) as a bioremediator of koi fish (Cyprinus carpio L.) waste in aquaponic systems. *Aquatic Journal*, *5*(2), 1-9. 7. Duka, K. K., Rebhung, F., **& Salosso, Y. (2019).** Effect of Probiotic Administration with Different Times on the Growth and Survival of Catfish (Pangasius sp) and Mustard Vegetables (Brassica juncea L) in the Aquaponic System. *Journal of Aquatics*, *2*(1), 24-35. 8. Lennard, W., & Ward, J. (2019). A comparison of plant growth rates between an NFT hydroponic system and an NFT aquaponic system. *Horticulturae*, *5*(2), 27.
Lecturer	Prof. Dr. Yuliana Salosso, S.Pi,MP Wesly Pasaribu, S.Pi, M.Si
Required Courses	Basics of aquaculture

Mg to-	**Final ability of each stage of learning (Sub-CLO)**	**Valuation**		**Forms of Learning; Learning Methods; Student Assignment Estimated Time**		**Learning Materials**	**Rating Weights (%)**
		Indicator	**Assessment Criteria**				
(1)	**(2)**	**(3)**	**(4)**	**Squirting (5)**	**Online (6)**	**(7)**	**(8)**
1	Sub CLO 1 : Understanding the Basic Concepts of Aquaponics	1.1 Precision explains the definition and history of aquaponics. 1.2 Precision explains the concept of integration of aquaculture and hydroponics	**Test Technique:** - **Quiz 1 : Essay Questions**	• **Lecture** • **Discussion** [PB: 1x(2x50")]	SIADIKNONA	- **Introduction to Aquaponics** ○ Definition and history of aquaponics	5

		1.3 Precision explains Comparison of aquaponics with conventional systems	**Kriteria**: Pedoman penskoran	**Task 1:** Quiz		○ Concept of integration of aquaculture and hydroponics ○ Comparison of aquaponics with conventional systems -	
2	Sub CLO 1 : Understanding the Basic Concepts of Aquaponics	2.1 Accuracy explains Media-based system 2.2 Precision describes the Nutrient Film Technique (NFT. 2.3 Precision explains Deep Water Culture (DWC) 2.4 Precision explains the design of household and commercial scale systems	**Test technique:** • Quiz 2; Essay Questions **Non-test techniques:** • Drawing the design, each type and design of the aquaponic system **Kriteria**: Rubric	• **Lecture** • **Discovery Learning** • **Discussion** **[**PB: 1x(2x50")] **Task 2:** • Drawing the design, each type and design of the aquaponic system [PT+KM1(1+1)x (2x60")]	SIADIKNONA	- **Types and Design of Aquaponic Systems** ○ Media-based system ○ Nutrient Film Technique (NFT) ○ Deep Water Culture (DWC) ○ Household and commercial scale system design	5
3	Sub-CLO-2: Analyzing Components and Design of Aquaponic Systems	3.1 Precision describes aquaponic components: Fish tanks, grow beds, pumps, biological and mechanical filters 3.2 Precision outlines Aerator components, plumbing system, and water quality sensors	**Non-test techniques:** • Making leafliet components of aquaponic systems **Kriteria**:	• **Lecture** • **Discovery Learning** • **Discussion** **[PB: 1x(2x50")]** • **Task 3:** Make a	SIADIKNONA	1. **Components of Aquaponic Systems** ○ Fish tanks, grow beds, pumps, biological and mechanical filters	5

			Headline Holistic	leafliet of the components of the aquaponic system . **[PT+KM1(1+1)x (2x60")]**		○ Aerators, plumbing systems, and water quality sensors	
4	Sub-CLO-3: Managing Water Quality in Aquaponic Systems	4.1 Precision management Important water quality parameters (pH, temperature, DO, ammonia, nitrites, nitrates) 4.2 Precision deciphers the nitrogen cycle in aquaponics 4.3 Precision in implementing water stability monitoring and maintenance techniques	**Non-test techniques:** • Create a paper **Kriteria**: Headline Holistic	• **Lecture** • **Case Study** • **Presentation and Discussion** **[PB: 1x(2x50")]** **Task 4:** Prepare a paper on water quality management in aquaponic aquaculture **[PT+KM1(1+1)x (2x60")]**	SIADIKNONA	1. **Water Quality and Its Management** ○ Important parameters (pH, temperature, DO, ammonia, nitrites, nitrates) ○ Nitrogen cycle in aquaponics ○ Water Stability Monitoring and Maintenance Techniques	5
5, 6	Sub-CLO-5: Applying Integrated Fish and Plant Cultivation Techniques	5.1 Precision explains choosing fish species (catfish, tilapia, koi, etc.) 5.2 Accuracy determines stocking density, implementation of feeding, and fish health management	**Non-test techniques:** • Proktek Making aquaponic cultivation **Test technique:** • Quiz 3	• **Lecture** • **Case Study** • **Presentation and Discussion**	SIADIKNONA	- **Fish Farming in Aquaponics** ○ Selection of fish species (catfish, tilapia, koi, etc.)	15

			Kriteria: Headline Holistic	**[PB: 1x(2x50")]** **Task 5:** Doing fish farming in an aquaponic system **[PT+KM1(1+1)x(2x60")]**		○ Stocking, feeding, and fish health management -	
7	Sub-CLO-5: Applying Integrated Fish and Plant Cultivation Techniques	6.1 Precision in selecting Plants suitable for aquaponics (kale, lettuce, spinach, etc. 6.2 Precision in applying Planting techniques and nutrient management	**Non-test techniques:** Proktek Making aquaponic cultivation **Test technique:** • Quiz 4 **Kriteria**: Headline Holistic	• **Lecture** • **Case Study** • **Presentation and Discussion** **[PB: 1x(2x50")]** **Task 6:** Proktek Making aquaponic cultivation **[PT+KM1(1+1)x(2x60")]**	SIADIKNONA	1. **Plant Cultivation in Aquaponics** ○ Plants suitable for aquaponics (kale, lettuce, spinach, etc.) ○ Planting techniques and nutrient management	10
8	**UTS: Mid-Semester Exam: Validate the results of assessment, evaluation and improvement of the next learning process**						
9	Sub-CLO-6: Integrating Appropriate Technologies in Aquaponic Aquaculture	7.1. Precision integrates Automation and IoT systems (temperature, pH, humidity sensors 7.2. Precision Use of alternative energy (solar panels, gravity system)	**Non-test techniques:** **Practice of implementing IOT** **Kriteria**: Rubrik Deskrptif	• **Lecture** • **Case study** • **Discussion** **[PB: 1x(2x50")]** **Task 7:**	SIADIKNONA	1. **Aquaponics Support Technology** ○ Automation and IoT systems (temperature, pH, humidity sensors)	10

				IoT Implementation Practices **[PT+KM1(1+1)x(2x60")]**		○ Use of alternative energy (solar panels, gravity system)	
10,11	Sub-CLO-6: Integrating Appropriate Technologies in Aquaponic Aquaculture	8.1 Precision designing aquaponic mini systems 8.2 Installation and operation of the system 8.3 Accuracy in documenting and evaluating fish and plant growth	**Non-test techniques:** The practice of designing mini aquaponics cultivation **Kriteria**: Headline Holistic	• **Lecture** • **Case study** • **Debate** **[PB: 1x(2x50")]** **Task 8:** The practice of designing mini aquaponics cultivation **[PT+KM1(1+1)x(2x60")]**	SIADIKNONA	1. **Aquaponics Systems Practicum** ○ Aquaponics mini system design ○ System installation and operation ○ Documentation and evaluation of fish and plant growth	15
12	Sub-CLO-7: Conducting Aquaponic Cultivation Practices Independently or in Groups	9.1 Accuracy in analyzing technical problems (leaks, blockages) 9.2 Accuracy in analyzing biological problems (fish diseases, stunted plant growth) 9.3 Accuracy of Analysis of Nutritional Imbalance Problems	**Non-test techniques:** Ptraktek analyzes problems in acuponic systems **Kriteria**: Category Descriptive	• **Lecture** • **Case study** • **Discussion** **[PB: 1x(2x50")]** **Task 9:** Ptraktek analyzes problems in the acuponic system	SIADIKNONA	1. **Common Problems in Aquaponics Systems** ○ Technical glitches (leaks, blockages) ○ Biological problems (fish diseases, stunted plant growth)	10

				[PT+KM1(1+1)x (2x60")]		○ Nutritional imbalance	
13	Sub-CLO-7: Conducting Aquaponic Cultivation Practices Independently or in Groups	10.1. Accuracy Identification of causes through water quality data and observation 10.2. Precision Design adjustment or system maintenance 10.3. Accuracy Simulation of system troubleshooting	**Non-test techniques:** • Create a report on work results **Kriteria**: Category Descriptive	• **Lecture** • **Case study** • **Discussion** **[PB: 1x(2x50")]** **Task 10:** Collect field data (observations, interviews) on strategic methods to overcome problems encountered in aquaponics. **[PT+KM1(1+1)x (2x60")]**	SIADIKNONA	- **Problem-Solving Strategies** ○ Identify causes through water quality data and observations ○ Design adjustments or system maintenance ○ System troubleshooting simulation -	10
14	Sub-CLO-8: Evaluating the Economic and Environmental Aspects of Aquaponics	11.1. Accuracy Calculation of installation and operational costs 11.2. Accuracy of Crop yield projections and ROI 11.3. Precision Market analysis for aquaponics products	**Non-test techniques:** • Create a report on work results **Kriteria**: Category Descriptive	• **Lecture** • **Case study** • **Discussion** **[PB: 1x(2x50")]** **Task 10:** Conduct an economic analysis of	SIADIKNONA	1. **Economic Feasibility Analysis of Aquaponic Systems** ○ Calculation of installation and operational costs	5

				aquaponic aquaponics. **[PT+KM1(1+1)x (2x60")]**		○ Crop yield projections and ROI ○ Market analysis for aquaponics products	
15	Sub-CLO-8: Evaluating the Economic and Environmental Aspects of Aquaponics	12.1. Precision evaluates Zero water and waste use efficiency 12.2. Accuracy in analyzing the potential for urban farming system development and community empowerment	**Non-test techniques:** • Create a report on work results **Kriteria**: Category Descriptive	• **Lecture** • **Case study** • **Discussion** **[PB: 1x(2x50")]** **Task 10:** Conduct environmental analysis of the dam from aquaponics. **[PT+KM1(1+1)x (2x60")]** •		1. **Environmental and Sustainability Aspects** ○ Zero water and waste efficiency ○ Potential for urban farming system development and community empowerment	5
16	**UAS: Final Semester Exam: Validating final assessments and determining student graduation**						**100**

FORMAT OF LESSON PLAN AND EVALUATION OF CASE-SOLVING COURSES IN MK "PARASITES AND FISH DISEASES"

1. LESSON PLAN FORMAT

NO	MEETING	MATERIAL	SUB MATERIAL
1	1	Introduction to Aquaponics	Definition and history of aquaponics Concept of integration of aquaculture and hydroponics Comparison of aquaponics with conventional systems
2	2	Types and Design of Aquaponic Systems	Media-based system Nutrient Film Technique (NFT) Deep Water Culture (DWC) Household and commercial scale system design
3	3	Components of Aquaponic Systems	Fish tanks, grow beds, pumps, biological and mechanical filters Aerators, plumbing systems, and water quality sensors
4	4,5	Water Quality and Its Management	Important parameters (pH, temperature, DO, ammonia, nitrites, nitrates) Nitrogen cycle in aquaponics Water Stability Monitoring and Maintenance Techniques
5	6	Fish Farming in Aquaponics	Selection of fish species (catfish, tilapia, koi, etc.) Stocking, feeding, and fish health management
6	7	Plant Cultivation in Aquaponics	Plants suitable for aquaponics (kale, lettuce, spinach, etc.) Planting techniques and nutrient management
7	**8**	**UTS: Semester Teangah Exam**	
8	9	Aquaponics Support Technology	Automation and IoT systems (temperature, pH, humidity sensors) Use of alternative energy (solar panels, gravity system)
9	10, 11	Aquaponics Systems Practicum	Aquaponics mini system design System installation and operation

			Documentation and evaluation of fish and plant growth
10	12	Common Problems in Aquaponics Systems	Technical glitches (leaks, blockages) Biological problems (fish diseases, stunted plant growth) Nutritional imbalance
11	13	Problem-Solving Strategies (2 times)	Identify causes through water quality data and observations Design adjustments or system maintenance System troubleshooting simulation
12	14	Economic Feasibility Analysis of Aquaponic Systems	Calculation of installation and operational costs Crop yield projections and ROI Market analysis for aquaponics products
13	15	Environmental and Sustainability Aspects	Zero water and waste efficiency Potential for urban farming system development and community empowerment
14	**16**	**UAS: Final Semester Exam**	

EVALUATION PLAN FORMAT

NO	EVALUATION BASIS	WEIGHT (%)	EVALUATION COMPONENTS	DESCRIPTION
1	Participatory activities	25		
2	Project results	25		
3	Cognitive/Knowledge	10	Assignment	Assignments for all topics
		10	Quiz	Quiz on 8 topics
		15	Mid-Semester Exam	Questions based on Sub-CLO indicators 1 - 6
		15	Final Semester Exam	Questions based on Sub-CLO indicators 7 - 10