

SEMESTER LESSON PLAN



LESSON PLAN DEVELOPER(S):

Prof. Ir. Sukoso, M.Sc, Ph.D

Lecturer in Aqua Genome, Faculty of Fisheries and Marine Science, Universitas Brawijaya

**AQUACULTURE MASTER'S PROGRAM
FACULTY OF FISHERIES AND MARINE SCIENCE
UNIVERSITAS BRAWIJAYA
2021**

SEMESTER LESSON PLAN

1. Course Identity

Study Program	: Aquaculture Master's Program
Course	: Aqua Genome
Course Code	: PIB8206
Course Group	: Reproduction
Credit	: 3
Degree	: Master's Degree
Semester	: Even
Pre-requisite	: (If any, write the course code)
Status	: Compulsory
Lecturers' Names and Codes:	Prof. Ir. Sukoso, M.Sc, Ph.D Dr. Uun Yanuhar, S.Pi., M.Si

2. Course Description

Aqua Genome is a course that allows students to understand the process and function of selection, as well as hybridization of superior quality broodstock, genetic manipulation and how to perform fish breeding to improve the quality and quantity of fish and seed aquaculture yields. Knowledge of these genetic aspects is expected to become a strong basis and skills in improving the production quality.

3. Program Learning Outcomes (PLO)

Being able to develop new concepts and knowledge in the field of breeding and reproduction of aquatic animals (CPL 6).

4. Course Learning Outcomes

After completing this course, students will be able to:

1. understand the development of fisheries genetics and examples of its application in the field of aquaculture.
2. understand the work principles of components used in genetic engineering.
3. comprehend the types of gene transfer techniques and relevant methods.

5. Lesson Plan

Week	PLO Indicator	Topic	Learning Method	Time Allotment	Learning Activities	Scoring	Learning Sources
1	1.1 Accuracy in explaining the notion of fishery genetics in general.	- Introduction to genetics in fisheries	<ul style="list-style-type: none"> • Lecture (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines - Non-test: summarizing the materials (A) - Group or independent presentation (S))	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
2	2.1 Accuracy in describing the objectives, methods, and components used in the isolation, identification, and characterization techniques.	Isolation, identification, Classical characterization, APT, andromass: - Objectives - Method - Components and tools	<ul style="list-style-type: none"> • Lecture (S) • Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
3	2.2 Accuracy in explaining the concepts of markers, extraction techniques, and detection.	- The concept of isozyme. - Sample preparation - Extraction - detection	<ul style="list-style-type: none"> • Lecture (S) • Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986.

Week	PLO Indicator	Topic	Learning Method	Time Allotment	Learning Activities	Scoring	Learning Sources
						- Group or independent presentation (S)	5) Zaldivar dan Imsiridou, 1999.
4	3.1 Accuracy in describing the components, steps, and the working mechanism in DNA, RNA, or protein transfer to membrane matrix.	Blotting (western, southern, northern): - Definition and history - Components - Steps and working mechanism	<ul style="list-style-type: none"> • quiz 1 (S) • Lecture (S) • Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
5	3.2 Accuracy in explaining the work principle, components, and the LC-GC-MC chromatography method..	LC-GC-MS: - Definition and function. - Work principle. - Components used. - Application method.	<ul style="list-style-type: none"> • Lecture (S) • Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
6	4.1 Accuracy in explaining the application of ELISA test and its advantages and disadvantages.	Enzyme linked immunoserbent assay (ELISA): - Work Principle of ELISA - Types of ELISA - Application of ELISA - Weaknesses and Strengths	<ul style="list-style-type: none"> • Lecture (S) • Lecture (S) • Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
7	4. 2 Accuracy in explaining the materials delivered	- Presentation and Discussion	<ul style="list-style-type: none"> • Lecture (S) 	2	Presentation and	Criteria: Scoring Guidelines	Materi minggu

Week	PLO Indicator	Topic	Learning Method	Time Allotment	Learning Activities	Scoring	Learning Sources
	in the previous week		<ul style="list-style-type: none"> Assignment (A) & Presentation (S) 		Discussion	Non-test: <ul style="list-style-type: none"> summarizing the materials (A) Group or independent presentation (S) 	sebelumnya
8	MIDTERM EXAM						
9	5.1 Accuracy in explaining fish genetics.	The basic of genome in animal aquatic: <ul style="list-style-type: none"> Gene interaction and expression. Causal relationship between environment and gene expression. The relationship between phenocopy and plasticity.. 	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: <ul style="list-style-type: none"> summarizing the materials (A) Group or independent presentation (S) 	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
10	5.2 Accuracy in explaining genetic engineering in fish reproduction.	Gene and reproduction in animal (genetic improvement): <ul style="list-style-type: none"> Genes and Chromosomes Gene Manipulation Chromosomal manipulation Cell Manipulation Fish Selection 	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: <ul style="list-style-type: none"> summarizing the materials (A) Group or independent presentation (S) 	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
11	6.1 Accuracy in understanding the gene transfer techniques, gene expression, DNA and RNA extraction, and PCR.	Transgenic genes and gene expression on fish:: <ul style="list-style-type: none"> Techniques of gene transfer (egg microinjection and electroporation in 	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test:	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan

Week	PLO Indicator	Topic	Learning Method	Time Allotment	Learning Activities	Scoring	Learning Sources
		fish sperm) - DNA-RNA Extraction - PCR				- summarizing the materials (A) - Group or independent presentation (S)	Imsiridou, 1999.
12	6.2 accuracy in understanding protein synthesis, gene regulation and homeostasis.	Protein synthesis and regulatory and gene homeostasis: - Receptor - activator	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.1
13	6.3 Accuracy in understanding the types of bioactive-producing micro algae and their application in fish cultivation.	Study reference of bioactive-producing microalgae: - Types of bioactive-producing microalgae. - The applications of bioactive-producing microalgae in aquaculture.	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A) - Group or independent presentation (S)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.
14	6.5 Accuracy in understanding the development of fisheries genetics, giving examples, explaining the techniques, and their impacts.	Gene Engineering: - The development of genetic engineering. - Examples of genetic engineering. - Genetic engineering techniques.	<ul style="list-style-type: none"> Lecture (S) Assignment (A) & Presentation (S) 	2	Note Taking (A) Working on Assignments (A)	Criteria: Scoring Guidelines Non-test: - summarizing the materials (A)	1) Gall, 1997. 2) Jusuf, 2001. 3) Purdom, 1995. 4) Tave, 1986. 5) Zaldivar dan Imsiridou, 1999.

Week	PLO Indicator	Topic	Learning Method	Time Allotment	Learning Activities	Scoring	Learning Sources
		- The impacts of genetic engineering.				- Group or independent presentation (S)	
15	7.1 Accuracy in explaining the materials delivered in previous weeks.	- Student Presentation	<ul style="list-style-type: none"> • Lecture (S) • Assignment (A) & Presentation (S) 	2	Presentation and Discussion	Criteria: Scoring Guidelines Non-test: <ul style="list-style-type: none"> - summarizing the materials (A) - Group or independent presentation (S) 	Materi pada Minggu Sebelumnya
16	FINAL EXAM						

Notes: S = Synchronous, A = Asynchronous, all soft skill achievement will be scored based on the analysis referring to the Learning Management System

6. References

- 1) Gall, G. A. E. 1997. Aquacultural Genetics and Breeding: National Research Priorities. DIANE Publishing. Collingdale. 56 hal.
- 2) Jusuf, M. 2001. Genetika, Struktur dan Ekspresi Gen. Sagung Seto. Bogor. 306 hal.
- 3) Purdom, EC. 1995. Genetics and Fish Breeding. Chapman & Hall. London. 277 hal.
- 4) Tave, D. 1986. Genetics for Fish Hatchery Managers. Avi Publishing Company. Westport, Connecticut. 436 hal.
- 5) Zaldivar, JM dan Imsiridou, A. 1999. Methodology and Formats for Genetic Identification of Fish Species. European Commision Joint Researc Centre. Italy.

7. Appendices

Appendix 1. *Learning Materials*

- PPT 1 : Introduction
 - PPT 2 : Isolation, identification, classical characterization, APT, andromass.
 - PPT 3 : Allozyme and isozyme
 - PPT 4 : Blotting (western, southern, northern)
 - PPT 5 : LC-GC-MS
 - PPT 6 : Profiling Blotting
 - PPT 7 : Enzyme linked immunoserbent association (ELYSA)
 - PPT 8 : Basic of genome on animal aquatic
 - PPT 9 : Genes and reproduction in animal (genetic improvement)
 - PPT 10 : Transgenic genes and gene expression in fish
 - PPT 11 : Protein synthesis, regulatory and homeostatic genes
 - PPT 12 : Reference study of microalgae and bioactive genes
 - PPT 13 : Pathomechanism of gene expression in pathogen
 - PPT 14 : Gene engineering
- Online learning resources: (URL/link)
and other learning resources: (URL/link)

Appendix 2. *Media*

Zoom Meeting: (URL/link)

Google Meet: (URL/link)

Appendix 3. *Assessment Instrument*

Scoring Rubric

Oral Presentation

Close to the Expectation (score 1-2)	Meeting the Expectation (score 3-4)	Exceeding the Expectation (score 5)
<ol style="list-style-type: none"> 1) Presentation is not organized and not well developed 2) Material is not well-explained well 3) Theories and concepts are not thoroughly discussed 4) Presentation is not clear and not fluent 5) Lack of confidence in delivery, mostly note reading 6) Voice is unclear 7) Presentation does not attract audiences' attention 8) Inadequate responses to questions, inadequate comprehension of the material 9) Unsynchronized presentations 10) Exceeding the time limit, failing to complete the presentation 	<ol style="list-style-type: none"> 1) Presentation is rather well -organized and developed 2) Fair comprehension of the material being delivered 3) Theories and concepts are fairly discussed thoroughly 4) Presentation is fairly clear and fluent 5) Showing fairly strong confidence and speakers read notes wisely 6) Voice is quite clear 7) Able to engage audience's attention 8) Fairly good in responding to questions, showing excellent comprehension of the material being presented 9) Good synchronization of presentation flow 10) Exceeding the time limit yet presenters managed to complete the presentation 	<ol style="list-style-type: none"> 1) Presentation is very well organized and creatively developed 2) Very strong knowledge regarding the material being presented 3) Theories and concepts are very thoroughly-discussed 4) Presentation is very clear and smooth 5) Excellent confidence in delivery, reading notes very wisely 6) Voice is very clear 7) Adequately attracts audiences' attention well 8) Responding to questions very well, very strong comprehension of the material being delivered 9) Very clear synchronization in presentation flow 10) Not exceeding the time limit, presentation is completed

Written Assignments

Essay

Under the average (score 1 – 4)	Within the Average (score 5 – 8)	Above the Average (score 9 – 12)	Perfect (score 13 – 15)
<ol style="list-style-type: none"> 1) Not using the right analytical method 2) Incorrect data analysis 3) Making wrong conclusions 	<ol style="list-style-type: none"> 1) Using acceptable analytical methods 2) Data are well analyzed 3) Making relevant conclusions 4) There is a fairly critical 	<ol style="list-style-type: none"> 1) Using a relatively precise analysis method 2) Proper data analysis 3) Making the right conclusion 	<ol style="list-style-type: none"> 1) Using the correct analytical method 2) Effective data analysis 3) Making strongly effective conclusions

<p>4) No critical analysis of the data available</p> <p>5) No references</p> <p>6) Unmatched literature review (theory, research) and questions</p> <p>7) Using non-standardized language and poor cohesion</p> <p>8) No explanation about the implications of the topics being discussed</p> <p>9) Essay is not systematically-structured</p>	<p>analysis of the data</p> <p>5) There are only one or two references yet irrelevant</p> <p>6) Matching literature review (theory, research) and question</p> <p>7) Using standard language with good cohesion between sentences</p> <p>8) The implications of the topics being discussed are explained yet less thoroughly</p> <p>9) Essay is not systematically-structured</p>	<p>4) Critical analysis of the data is found</p> <p>5) There are many references yet irrelevant at this point</p> <p>6) Matching literature review (theory, research) and questions</p> <p>7) Using standard language and sentences are cohesive</p> <p>8) There is a unique and critical explanation of the implications of the topics being discussed</p> <p>9) Essay is systematically-arranged</p>	<p>4) There is a strong critical analysis of the data</p> <p>5) There are many references with strong relevancy</p> <p>6) Strongly matching literature review (theory, research) and questions</p> <p>7) Using standard language with strong cohesion between sentences</p> <p>8) There is a unique and very critical explanation of the implications of the topics being discussed</p> <p>9) Essay is systematically and neatly arranged</p>
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Report

<p>Under the average</p> <p>(score 1 – 4)</p>	<p>Within the Average</p> <p>(score 5 – 8)</p>	<p>Above the Average</p> <p>(score 9 – 12)</p>	<p>Perfect</p> <p>(score 13 – 15)</p>
<p>1) Not using the right analytical method</p> <p>2) Incorrect data analysis</p> <p>3) Making wrong conclusions</p> <p>4) No critical analysis of the data available</p> <p>5) No references</p> <p>6) Unmatched literature review (theory, research) and questions</p> <p>7) Using non-standardized language and poor cohesion</p> <p>8) No explanation about the implications of the topics being discussed</p>	<p>1) Using acceptable analytical methods</p> <p>2) Data are well analyzed</p> <p>3) Making relevant conclusions</p> <p>4) There is a fairly critical analysis of the data</p> <p>5) There are only one or two references yet irrelevant</p> <p>6) Matching literature review (theory, research) and question</p> <p>7) Using standard language with good cohesion between sentences</p> <p>8) The implications of the topics being discussed are</p>	<p>1) Using a relatively precise analysis method</p> <p>2) Proper data analysis</p> <p>3) Making the right conclusion</p> <p>4) Critical analysis of the data is found</p> <p>5) There are many references yet irrelevant at this point</p> <p>6) Matching literature review (theory, research) and questions</p> <p>7) Using standard language and sentences are cohesive</p> <p>8) There is a unique and</p>	<p>1) Using the correct analytical method</p> <p>2) Effective data analysis</p> <p>3) Making strongly effective conclusions</p> <p>4) There is a strong critical analysis of the data</p> <p>5) There are many references with strong relevancy</p> <p>6) Strongly matching literature review (theory, research) and questions</p> <p>7) Using standard language with strong cohesion between sentences</p> <p>8) There is a unique and very</p>

9) Report is not systematically-structured	explained yet less thoroughly 9) Report is relatively not systematically-structured	critical explanation of the implications of the topics being discussed 9) Report is systematically-arranged	critical explanation of the implications of the topics being discussed 9) Report is systematically and neatly arranged
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