


# COURSE LEARNING PLAN

	UNIVERSITY OF BRAWIJAYA FACULTY OF ANIMAL SCIENCE DEPARTMENT OF ANIMAL SCIENCE UNDERGRADUATE STUDY PROGRAM OF ANIMAL SCIENCE LEARNING PLAN			
Course	Code	Weight (credits)	Semester	Compilation Date
Genetics	PEP 60006	2	3	January 14, 2020
Authorization	Course Coordinator	Head of Undergraduate Study Program of Animal Science		Vice Dean 1
	Prof. Dr. Ir. Sucik Maylinda, MS	Dr. Herly Evanuarini		Dr. Halim Natsir
Learning Outcomes (LO)	PLO			
	1. LO6: Able to apply biological science, physiology, nutrition science, breeding science, animal raising management to comprehend the concept and implement it in the field of animal science			
	2. CP4: Able to develop comprehensive insight and mindset according to the science and field of the animal industry			
	CLO			
	1. Able to study and understand various genetic science theories (LO6)			
	2. Able to understand and update the development of Genetic Science and the application in the field of animal science (LO4)			
Brief Course Description	This course consists of understanding the basics of inheritance, as well as exploring events in nature, especially in the field of animal science from a genetic aspect. Individual and group assignments will be given to practice the ability to solve problems of inheritance in animals. Topics that will be discussed are: history and development of Genetics, Mendelian Law and Inheritance Patterns of Monohybrid and Dihybrid Traits, Deviations of Mendel's Law, Genetic Matter (Cells, Chromosomes, Genes, RNA and DNA), Abnormalities due to chromosomal abnormalities, Sex Determination, Sequencing and Cross Moving, Multiple Alleles, Probability theory, Basis of population genetics, Polygen, and Basis of Genetic engineering.			
Topic/Sub-Course/ Subject	1. Introduction 2. Mendel's Law (Inheritance of monohybrid and dihybrid) 3. Mendel's Law Deviations 4. Genetic Matter (cells, chromosomes, genes, DNA and RNA)			

	5. Mutation 6. Sex-determination, sequencing and crossing over 7. Double alleles 8. Polygene, Qualitative and quantitative properties 9. Chance theory 10. The basis of population genetics 11. Changes in Gene Frequency and Hardy Weinberg’s Law 12. Basic genetic engineering					
Reference	1. Gardner E.J. and D.P. Snustad. 1981. Principles of Genetics. 6 <sup>th</sup> Ed. John Wiley & Sons. Singapore. 2. Gatot C., A. Budiarto, Aulaniam, Y. Oktanela. 2019. Genetika, Pemuliaan dan Peternkan-Veteriner 3. Maylinda, S. 2011. Genetika dan Genetika Populasi. Lecture Dictate. Faculty of Animal Science, University of Brawijaya, Malang 4. Maylinda, S. 2011. Pengantar Pemuliaan Ternak. Textbook, Penerbit: UB Press. 5. Minkema, D. 1993. Dasar Genetika dalam Pembudidayaan Ternak. Second Edition. PT Bhratara Niaga Media, Jakarta.					
Learning Media	Software		Hardware			
Teaching Team	1. Prof. Dr. Ir. V.M. Ani Nurgiartiningsih, MSc 2. Prof. Dr. Ir. Luqman Hakim, MS 3. Prof. Dr. Ir. Gatot Ciptadi, DESS, IPU, ASEAN Eng. 4. Prof. Dr. Ir. Sucik Maylinda, MS 5. Dr. Ir. Agus Budiarto, MS 6. Dr. A. Furqon, SPt.					
Prerequisite Courses	Biology, Anatomy and Physiology, Animal Biochemistry					
Week	Sub-Course Learning Outcomes (SCLO)	Indicator	Learning Materials / Topics	Learning Methods	Criteria & Form of Assessment	Weighted Score (%)
(1)	(2)	(3)	(4)	(5)	(6)	
1.	• Able to understand the history of genetic development	• Able to explain the history of genetic development	INTRODUCTION • History of the Genetics development	• Lecture • Discussion	• Activeness / Participation in class	5%


	<ul style="list-style-type: none"> <li>Understanding the importance of genetic science in the field of animal science</li> </ul>	<ul style="list-style-type: none"> <li>Able to explain the importance of genetics in the field of animal husbandry</li> </ul>	<ul style="list-style-type: none"> <li>The importance of genetics in the field of animal husbandry</li> </ul>			
2.	Understand Mendel's law regarding the inheritance of monohybrid and dihybrid traits in animals	<ul style="list-style-type: none"> <li>Able to understand and explain monohybrid inheritance patterns</li> <li>Able to understand and explain dihybrid inheritance patterns</li> </ul>	MENDEL'S LAW (Monohybrid and dihybrid inheritance): The concept of Mendelian inheritance about monohybrid and dihybrid	<ul style="list-style-type: none"> <li>Lecture</li> <li>Case study</li> </ul>	<ul style="list-style-type: none"> <li>Activeness/ participation in answering questions</li> </ul>	5%
3	Understanding the causes of the diversity of inheritance patterns in nature	<ul style="list-style-type: none"> <li>Able to describe and detect traits that deviate from Mendel's Law</li> <li>Able to explain the pattern of inheritance that deviates from Mendel's Law</li> </ul>	MEDEL'S LAW DEVIATION (Intermediary traits, sex-linkage, multiple alleles, lethal genes, gene interactions, sex-limited and sex-influenced inheritance)	<ul style="list-style-type: none"> <li>Lecture</li> <li>Discussion and case study</li> </ul>	<ul style="list-style-type: none"> <li>Activeness/ participation in answering questions</li> <li>Quiz</li> </ul>	10%
4	<ul style="list-style-type: none"> <li>Able to understand the parts and functions of cells and chromosomes in animals</li> <li>Able to understand chromosomal abnormalities in animals</li> <li>-</li> </ul>	Able to explain genetic material and trait abnormalities in animals	GENETIC MATERIAL I (Cells, Chromosomes and genes, and chromosomal abnormalities)	<ul style="list-style-type: none"> <li>Lecture</li> <li>Discussion</li> </ul>	Activeness/ participation in answering discussion	5%
5	Able to understand the parts and functions of DNA and RNA and	Able to explain and participate actively in discussions about DNA and RNA	GENETIC MATERIAL II (DNA and RNA)	<ul style="list-style-type: none"> <li>Lecture</li> <li>Discussion</li> </ul>	Activeness/ participation in answering discussion	10%

	chromosomes in animals					
6	Able to understand the basics of gender determination, sequencing theory and crossing over	Able to explain correctly the basics of sex determination, sequencing theory and crossing over	Type of sex determination, series on autosomes and sex chromosomes, and crossing over	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> </ul>	Activeness/ Participation in discussions	5%
7	<ul style="list-style-type: none"> <li>• Able to understand multiple alleles</li> <li>• Able to understand the pattern of inheritance of multiple allele traits</li> </ul>	<ul style="list-style-type: none"> <li>• Able to explain the meaning of multiple alleles</li> <li>• Able to explain the genotypic and phenotypic ratios of the inheritance pattern of multiple alleles</li> </ul>	<p>MULTIPLE ALLELES:</p> <ul style="list-style-type: none"> <li>• able to explain the meaning of multiple alleles</li> <li>• Able to explain the genotypic and phenotypic ratios of the inheritance pattern of multiple alleles</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion and case study</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in answering questions</li> <li>• Quiz</li> </ul>	10%
8	Able to understand opportunity theory in the field of animal science	Able to explain several theories of opportunity and their application in the field of animal science correctly	THEORY OF OPPORTUNITY and the application in the field of animal science	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion and case study</li> </ul>	Activeness / participation in answering questions	5%
9	Able to understand population genetics theory	Able to calculate the frequency of genes and genotypes correctly	<p>BASIC POPULATION GENETICS</p> <p>The definition of the frequency of genes/ alleles, genotype and phenotype frequencies and their calculations</p>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion and case study</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in answering questions</li> <li>• Quiz</li> </ul>	10%
10	Understand the factors causing changes in gene	Able to correctly explain the factors that cause changes in gene	CHANGES IN GENE FREQUENCY AND	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Group Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in discussion</li> </ul>	5%

	frequency and Hardy Weinberg's law	frequencies and change the balance of the population	THE HARDY WEINBERG'S LAW Factors that cause gene frequency changes in gene frequency and genotype			
11	Understanding Hardy Weinberg's Law and THE role in population balance	<ul style="list-style-type: none"> <li>• Able to correctly explain Hardy Weinberg's Law</li> </ul>	CONTINUATION ABOUT HARDY WEINBERG'S LAWS Hardy Weinberg's Terms Genetic effects of population imbalance	Group presentations and discussions	<ul style="list-style-type: none"> <li>• Activeness / participation in answering questions</li> <li>• Content Short paper</li> </ul>	10%
12	Understanding polygenic inheritance in animals	Able to correctly explain the inheritance of polygenic traits in animals	POLYGENIC <ul style="list-style-type: none"> <li>• Effect of additive vs non-additive genes</li> <li>• The mating pattern of polygenic traits and the ratio of the offspring</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in answering questions</li> </ul>	10%
13	Understanding the meaning of qualitative and quantitative characteristics and their differences	Able to explain the difference in qualitative and quantitative traits in the animal husbandry sector correctly	Qualitative and Quantitative <ul style="list-style-type: none"> <li>• Understanding qualitative and quantitative properties and their differences</li> <li>• The relevance of qualitative and quantitative traits in the animal husbandry sector</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion and case study</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in discussion</li> </ul>	5%

14	Students are able to understand the basics of genetic engineering	The individual student is able to provide one correct example of genetic engineering in animal husbandry	Genetic engineering list <ul style="list-style-type: none"> <li>• Genetic basics in genetic engineering (chromosomes, DNA)</li> <li>• Recombinant DNA, transgenic</li> <li>• Advantages and disadvantages</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Activeness / participation in discussion</li> <li>•</li> </ul>	5%
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## ASSESSMENT RUBRIC

	UNIVERSITY OF BRAWIJAYA FACULTY OF ANIMAL SCIENCE DEPARTMENT OF ANIMAL SCIENCE UNDERGRADUATE STUDY PROGRAM OF ANIMAL SCIENCE		
Course	Genetics		
Score Level	CLO and PLO	Conversion	PLO Score
LO 6: Able to apply biological science, physiology, nutrition science, breeding science, animal raising management to comprehend the concept and implement it in the field of animal science CLO 1: Able to study and understand various genetic science theories			
Very Good (4)	showing a <b>very good</b> conceptual understanding of genetic science theory	>80-100	1
Good (3)	showing a <b>good</b> conceptual understanding of genetic science theory	>70-80	0.75
Moderate (2)	showing a <b>moderate</b> conceptual understanding of genetic science theory	>60-70	0.5
Poor (1)	showing a <b>poor</b> conceptual understanding of genetic science theory	≤60	0.25
Score Level	CLO and PLO	Conversion	PLO Score
LO 4: Able to develop comprehensive insight and mindset according to the science and field of the animal industry CLO 2: Able to understand and update about the development of Genetic Science and its application in the field of animal science			
Very Good (4)	Showing a <b>very good</b> understanding of concepts based on the development of Genetic Science and the application in the field of animal science	>80-100	1
Good (3)	Showing a <b>good</b> understanding of concepts based on the development of Genetic Science and the application in the field of animal science	>70-80	0.75
Moderate (2)	Showing a <b>moderate</b> understanding of concepts based on the development of Genetic Science and the application in the field of animal science	>60-70	0.5
Poor (1)	Showing a <b>poor</b> understanding of concepts based on the development of Genetic Science and the application in the field of animal science	≤60	0.25

$$\text{Calculating PLO Score: } \frac{\text{Level Skor}}{\sum \text{level skor}} \times \frac{\sum \text{CLO}}{\sum \text{PLO}}$$

### CLO Score Calculation

Assessed components	Component Weights	CLO Weight on the Score	
		CLO 1	CLO 2
Midterm Test	0.35	0.5	0.5
Final exam	0.35	0.5	0.5
Group assignment	0.15	0.5	0.5
Structured individual assignments and Quiz	0.15	0.5	0.5
CLO Weight			

The orange color must be fulfilled by the lecture

Steps to fulfill:

1. Assessment component = components that will be assessed in one course (for example midterm exam, final exam, quizzes percentage, etc.)
2. Component weight = Determine the weight of each component in which the total of all components is 1
3. CLO weight on the score
  - a. Show the number of CLO in each subject (for example, the subject of the Animal Feed Industry has 4 CLOs).
  - b. Determine the components of the assessment with the aim of reaching the CLO number
  - c. The total weight of the CLO score for each component is 1

#### PLO Score Calculation

CLO	CLO Score	CLO Weight	PLO	
			PLO 4	PLO 6
CLO 1				1
CLO 2			1	

The orange color must be fulfilled by the lecture


Steps to fulfill:

1. CLO= write down the number of CLO in each course (refer to the previous table)
2. PLO = Write down the number of PLO for each course based on the RPS
3. PLO Weight
  - a. Show the number of PLO in each course (for example, the Animal Feed Industry course has 3 PLOs).
  - b. Determine the components of the assessment aimed at achieving any PLO number
  - c. The total weight of the PLO score for each component is 1

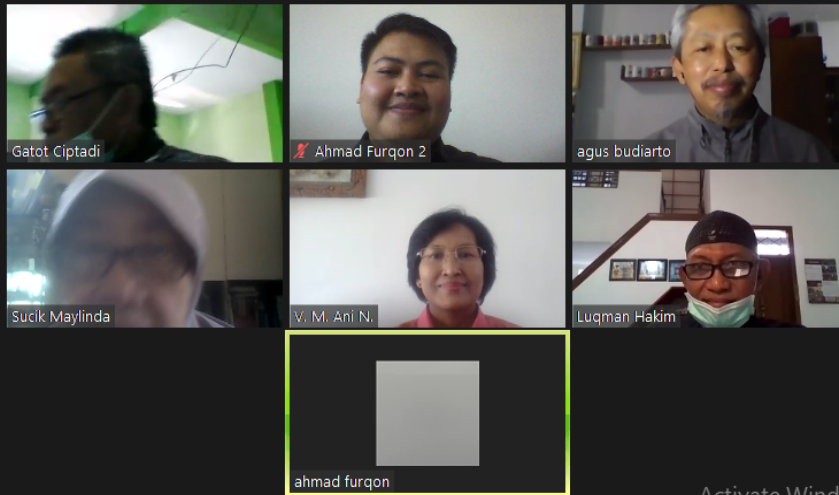




## Lecture Portfolio

		<b>UNIVERSITY OF BRAWIJAYA</b> <b>FACULTY OF ANIMAL SCIENCE</b> <b>DEPARTMENT OF ANIMAL SCIENCE</b>		
Course: Genetics		Code: PEP 60006	RMK:	Semester: 3
Lecturers	Prof. Dr. Ir. V.M. Ani Nurgiartiningsih, MSc Prof. Dr. Ir. Luqman Hakim, MS Prof. Dr. Ir. Gatot Ciptadi, DESS, IPU, ASEAN Eng. Prof. Dr. Ir. Sucik Maylinda, MS Dr. Ir. Agus Budiarto, MS Dr. A. Furqon, SPt.			
<b>Introduction</b> (Explain the description needed about this course, experiences that have been conducted) This course consists of understanding the basics of inheritance, as well as exploring events in nature, especially in the field of animal science from a genetic aspect. Individual and group assignments will be given to practice the ability to solve problems of inheritance in animals. Topics to be discussed are: history and development of Genetics, Mendelian Law and Inheritance Patterns of Monohybrid and Dihybrid Traits, Deviations of Mendel's Law (Lethal Genes and Gene Interactions), Genetic Matter (Cells, Chromosomes, Genes, RNA and DNA), Abnormality due to abnormalities chromosomes, Sex Determination, Sequencing and Cross Moving, Multiple Alleles, Theory of chance, Basis of population genetics, Polygene, and Basis of Genetic engineering				
1	<b>Objectives</b> (Describe general or specific course objectives) 1. Able to study and understand various genetic science theories 2. Able to understand and update about the development of Genetic Science and the application in the field of animal science			
2	<b>Learning Strategy</b> (Describe the strategies used to achieve course objectives - CLO) Learning strategies conducted in lectures are giving lectures, discussions, structured assignments, quizzes, exercise and group assignments			
3	<b>Lecture Management</b> (Describe the management of lectures: lectures, tutorials, practicum, assignments, major assignments, etc.) 1. The lectures are conducted for 2x50 minutes for 14 meetings (offline) or the lectures are held for 1x50 minutes for 14 meetings (Online) 2. Self-structured assignments 3. Quiz 4. Group assignment			
4	<b>Lecture Contents</b> (explain the suitability with the applicable curriculum) 1. Introduction 2. Mendel's Law (Inheritance of monohybrid and dihybrid) 3. Mendel's Law Deviations 4. Genetic Matter (cells, chromosomes, genes, DNA and RNA)			

	5. Mutation 6. Sex determination, sequencing and crossing over 7. Multiple alleles 8. Polygene, Qualitative and quantitative properties 9. Chance theory 10. The basis of population genetics 11. Changes in Gene Frequency and Hardy Weinberg's Law 12. Basic genetic engineering
5	<b>Lecture Participants</b> (provide an overview of lecture participants) The lecture participants are students of University of Brawijaya who have passed the pre-requisite courses of Biology, Anatomy and Physiology, Animal Biochemistry.
6	<b>Attendance Percentage</b> (% attendance of lecturers; % attendance of students) % of lecturer attendance: 100% % student attendance: at least 80%
7	<b>Evaluation System</b> (explain homework, quizzes, group assignments, practicum, etc.) 1. Quiz is done before and after Midterm Exam 2. Self-structured assignments are given 1x before Midterm Exam and 1x after Midterm Exam 3. Group assignments are given 1x before Midterm Exam and 1x after Midterm Exam 4. Midterm Exam 5. Final Exam
8	<b>Class Observation</b> (explain important and interesting things encountered during the lecture) 
9	<b>Learning Outcomes</b> (explain the achievement of the goals that have been set including learning achievements that can be explained) Able to apply biological science, physiology, nutrition science, breeding science, animal raising management to comprehend the concept and implement it in the field of animal science (LO6) Able to develop comprehensive insight and mindset according to the science and field of the animal industry (LO4)
10	<b>Obstacles</b> (give an overview of the main obstacles in learning) 
11	<b>Score Distribution</b> (provide the score distribution following the learning achievements of this course) Midterm test: 35% Final Exam: 35% Individual structured assignments/quizzes: 15% Group assignment: 15%
12	<b>Conclusion</b> 
13	<b>Improvement Recommendations</b> 
	<b>Appendices:</b> 1. 2. etc.



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