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
Applied Statistics and Experimental Design	PEF 60003	3	3	August 28, 2020

Authorization	Supervising Lecture	Head of Undergraduate Study Program of Animal Science	Vice Dean 1
	Prof. Dr. Ir. V.M Ani Nurgiartiningsih, MSc	Dr. Ir. Herly Evanuarini, MS	Dr. M. Halim Natsir, S.Pt., MP., IPM., ASEAN Eng

Learning Outcomes (LO)	PLO
	1. LO 4: Able to develop comprehensive insight and mindset according to the science and field of the animal industry 2. LO 11: Able to show performance, both independently and in teamwork (inter- and multi-disciplinary), identify and analyze to solve problems in quality and measurable way 3. LO 12: Able to design and conduct experiments, analyze and interpret data to make correct decisions in solving problems in the field of animal science, meet ethics, and have environmental insight
	CLO
	1. Able to determine type of statistic and correct experimental design (LO 4 and LO 12) 2. Able to calculate data from observations and experiments (LO 11, LO12) 3. Able to analyze and conclude the results of data calculations from observations and experiments (LO 4 and LO 12)
Brief Course Description	Studying statistic and experimental design sciences to be applied in animal research. Practicum, individual and group assignments are given for the ability to conduct analysis and provide conclusions. Topics studied consist of the function and role of statistics, continuous random

	probability distribution, regression and correlation, experimental design and introducing the use /application of statistical analysis programs.
Sub-Course/Topics	1. INTRODUCTION 2. Continuous random odds distribution 3. Chi square 4. T Student 5. Regression and Correlation 6. Introduction to Experimental Design 7. Completely Randomized Design (CRD) 8. Treatment Average Testing 9. Randomized Block Design (RBD) 10. Latin square design and Cross over design 11. Factorial experiment 12. Nested experiment 13. Variety Analysis 14. Transformations and Excell applications
References	1. Bate, S.T. and R.A. Clark. 2014 The Design and Statistical Analysis of Animal Experiments. Cambridge University Press. United States of America Cochran, W.G., 2007 Sampling Techniques, Third Edition. Wiley India Pvt. Limited 3. Dean, A., D. Voss and D. Draguljic. 2017 - Design and Analysis of Experiments. Second **E**dition**.** Springer International Publishing. Switzerland 4. Kutner, Nachtsheim and Neter. 2018. Applied Linear Regression Mode. Mcgraw-Hill Education – Europe Montgomery, D.C., 2008. Design and Analysis of Experiments. John Wiley & Sons, Inc. New York 5. Petrie, A.and P. Watson. 2013. Statistics for Veterinary and Animal Science. Third Edition. Wiley-Blackwell 6. Rumsey, D.J. 2011. Statistics For Dummies. John Wiley & Sons. Inc. New York Ryan, T.P., 2007. Modern Experimental Design. John Wiley & Sons, Inc. New York 7. Steel and Torrie. 1980. Prinsicple andProcedure Statistics. McGraw Hill Book co. New York 8. Cochran, W.G. 1977. Sampling Techniques. 3rd Ed John Wiley n son s, Inc. New york 9. Neter, J,W. Wasemann and M.H. Kutler. 1983. Applied Linear Regression Model. Richard D. Irwin Inc. Ililiois

	10. Gill, J.L. 1978. Design and analysis of experiments in the animal and medical science. Vol. 1 and 2. Iowa state Univ. Press 11. Herni, S., *et al*. 2018. Statistik dan Rancangan Percobaan Penerapan Dalam bidang Peternakan	
Learning Media	Software	Hardware
	Excel Program	Laptop/ computer
Teaching Team	1. Prof. Dr. Ir. Luqman Hakim, MS 2. Prof. Dr. Ir. Gatot Ciptadi, DESS, IPU., ASEAN Eng 3. Prof. Dr. Ir. Sucik Maylinda, MS. 4. Prof. Dr. Ir. V.M Ani Nurgiartiningsih, MSc 5. Dr. Ir. Herni Sudarwati, MS 6. Dr. Ir. Agus Budiarto, MS 7. Dr. Ir. Osfar Sjofjan, MSc, IPU, ASEAN Eng 8. Dr. Ir. Irfan H.Djunaidi., MSc, IPM,. ASEAN Eng 9. Dr. M. Halim Natsir, S.Pt., MP., IPM., ASEAN Eng 10. Ir. Nur Cholis, MS, IPM, ASEAN Eng 11. Asri Nurul H, SPt., MP., MSc	
Prerequisite Course		

Week	Sub-Course Learning Outcome	Indicator	Learning Material/Topic	Learning Method	Criteria & Form of Assessment	%
(1)	(2)	(3)	(4)	(5)	(6)	
1	Able to explain concentration measure for non-grouped and grouped data	Able to count mean, mode, median, standard deviation, variance, standard error of non-grouped data and grouped data.	INTRODUCTION ● Course contract, Semester Program and Learning Plan ● The role and function of statistics and data presentation ● The importance of statistics in the field of animal science, frequency distribution ● Centering measure (Definition of mean, mode, median, standard deviation, variance, standard error)	● Lecture ● Discussion		
2	Able to explain continuous random probability distribution, hypothesis and mean testing, proportion, 2 means	● Able to calculate proportions with normal distribution ● Able to test mean, proportion, 2 mean from normal distribution based on the proposed hypothesis	Continuous random odds distribution ● Understanding the normal distribution ● Definition of hypothesis ● Testing of mean, proportion, and two means	● Lecture ● Discussion		
3	Be able to explain Distribution of Chi-squared and its applications	● Able to test binomial, multinomial and data with contingency factors	DISTRIBUTION of Chi-Squared ● Test of binomial and multinomial data ● Analysis of 2 contingency factors	● Lecture ● Discussion ● Exercises		

4	Able to explain and test the student t distribution	Able to test observational data by testing paired t and unpaired t	DISTRIBUTION of Student t ● Paired t test ● Unpaired t test	● Lecture ● Discussion ● Exercises	Quiz	
5	Able to evaluate and analyze with linear regression and correlation	Able to evaluate and test observations with linear regression and correlation	REGRESSION and CORRELATION: ● Linear Regression ● Correlation ● Multiple regression	● Lecture ● Discussion ● Exercises		
6	Able to explain experimental design	Able to explain the meaning of treatment, replication, randomization and experiment objectives	EXPERIMENTAL DESIGN: ● Definition of treatment, replication, objectives, experiments, research stages	● Lecture ● Discussion		
7	Able to evaluate and analyze data using RAL (completely randomized design)	Able to apply and analyze Observation/experimental data with RAL and Sub Sampling RAL	Completely Randomized Design (RAL) and Sub Sampling RAL ● Definition and stages of RAL ● ANOVA RAL ● Advantages and disadvantages of RAL	● Lecture ● Discussion ● Exercises	Task	
MIDTERM EXAM						
8	Able to explain average treatment test	● Able to test average treatment with Smallest Real Different (SRD/BNT), BNJ and Duncan	Average Treatment Test ● Testing the average treatment with LSD, BNJ and Duncan ● Notation of analysis results	● Lecture ● Discussion ● Exercises		
9	● Able to explain and evaluate Randomized Block Design (RAK) and Sub Sampling of RAK ● Able to explain and evaluate experiments with	● Able to analyze data using RAK, RAK Sub Sampling ● Able to analyze variance in experiments with missing /extreme data	Randomized Block Design (RBD) and Sub Sampling Randomized Design ● Research stages, analysis of variance ● Advantages and disadvantages of RAL ● Missing data of RAK	● Lecture ● Discussion		

	missing/extreme data					
10	Able to explain and evaluate Latin Square Design (RBSL) and Cross Over Design	● Able to analyze data using RBSL Cross Over Design ● Able to conclude the results of the analysis	Latin Square Design (RBSL) and Cross Over Design ● Research stages, analysis of variance ● Advantages and disadvantages of RBSL.	● Lecture ● Discussion		
11	Able to explain and evaluate Factorial experiments with RAL and RAK	● Able to analysis data using a factorial design with RAL and RAK	Experiment Factor ● Definition of the interaction between factors ● Stages of research and analysis of variance with RAL and RAK	● Lecture ● Discussion	Quiz	
12	Able to explain and evaluate nested experimental design	● Able to evaluate data using nested experimental design	Nested Experimental Design - Definition of nested experiment - The stages of analysis of various nested experiments with RAL, RAK	● Lecture ● Discussion		
13	Able to explain and evaluate experimental design with variety and split plot design	● Able to explain use of experimental designs with variety ● Able to explain the use of the Divided Plot Design	Experimental Design with Variety ● Definition ● Stages of research and analysis of variance with RAL and RAK ● Divided plot analysis stages with RAL, RAK	● Lecture ● Discussion		
14	Able to explain data transformation and use of software for statistical analysis	● Able to conduct data transformation using logarithma, square root and Arcsin ● Able to apply Excel for statistical data analysis	● Data transformation using logarithma, square root and Arcsin ● Excel program for statistical data analysis	● Lecture ● Discussion ● Exercises	Task	
FINAL EXAM						

ASESEMENT RUBRIC

	UNIVERSITY OF BRAWIJAYA FACULTY OF ANIMAL SCIENCE DEPARTMENT OF ANIMAL SCIENCE UNDERGRADUATE STUDY PROGRAM OF ANIMAL SCIENCE		
Course	Applied Statistics and Experimental Design		
Score Level	CLO an PLO	Conversion	PLO Score
Program Learning Outcomes of S1: - Able to develop comprehensive insight and mindset according to the science and field of the animal industry (LO 4) - Able to design and conduct experiments, analyze and interpret data to make correct decisions in solving problems in the field of animal science, meet ethics, and have environmental insight (LO 12) Course Learning Outcome 1: Able to determine the correct type of statistics and experimental design			
Very Good (4)	Have **very good** ability to determine the correct statistical type and experimental design in a case.	80-100	0.75
Good (3)	Have **good** ability to determine the correct statistical type and experimental design in a case.	70-79	0.5
Moderate (2)	Have **moderate** ability to determine the correct statistical type and experimental design in a case.	60-69	0.375
Poor (1)	Have **poor** ability to determine the correct statistical type and experimental design in a case.	<60	0.125
Score Level	CLO and PLO	Conversion	PLO Score
Program Learning Outcomes of S1: - Able to show performance, both independently and in teamwork (inter- and multi-disciplinary), identify and analyze to solve problems in quality and measurable way (LO 11) - Able to design and conduct experiments, analyze and interpret data to make correct decisions in solving problems in the field of animal science, meet ethics, and have environmental insight (LO 12)			

Course Learning Outcome 2: Be able to count data from observations and experiments			
Very Good (4)	Have **very good** ability to count data from observations and experiments	80-100	0.75
Good (3)	Have **good** ability to count data from observations and experiments	70-79	0.5
Moderate (2)	Have **moderate** ability to count data from observations and experiments	60-69	0.375
Poor (1)	Have **poor** ability to count data from observations and experiments	<60	0.125
Score Level	CLO and PLO	Conversion	PLO Score
Program Learning Outcomes of S1: - Able to develop comprehensive insight and mindset according to the science and field of the animal industry (LO 4) - Able to design and conduct experiments, analyze and interpret data to make correct decisions in solving problems in the field of animal science, meet ethics, and have environmental insight. (LO 12) Course Learning outcome 3: Able to analyze and conclude the results of data calculations from observations and experiments			
Very Good (4)	Showing the ability to analyze and conclude calculation results **very well**	80-100	0.5
Good (3)	Showing the ability to analyze and conclude calculation results **well**	70-79	0.375
Moderate (2)	Showing **moderate** ability to analyze and conclude calculation results	60-69	0.25
Poor (1)	Showing **poor** ability to analyze and conclude calculation results	<60	0.125

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

Calculation of CLO Score

Components Assessed	Component Weights	Weight of Course Learning Outcome (CLO)		
		CLO 1	CLO 2	CLO 3
Practicum	0.3	0.3	0.4	0.3
Midterm Exam	0.3	0.2	0.5	0.3
Final Exam	0.3	0.2	0.5	0.3
Assignment	0.05	0.2	0.5	0.3
Quiz	0.05	0.4	0.3	0.3
Weight of Course Learning Outcome (CLO)				

Calculation of PLO Score

CLO	CLO Score	CLO Weight	PLO		
			PLO 4	PLO 11	PLO 12
CLO 1			0.7		0.3
CLO 2				0.4	0.6
CLO 3			0.3		0.7

Basic Format for the Lecture Portfolio

	UNIVERSITY OF BRAWIJAYA **FACULTY OF ANIMAL SCIENCE** **DEPARTMENT OF ANIMAL SCIENCE**

Course: Applied Statistics and Experimental Design	Code: PEF60003	RMK/Contract Quality Plan:	Semester: 4

Lecturers	1. Prof. Dr. Ir. Luqman Hakim, MS 2. Prof. Dr. Ir. Gatot Ciptadi, DESS, IPU., ASEAN Eng 3. Prof. Dr. Ir. Sucik Maylinda, MS. 4. Prof. Dr. Ir. V.M Ani Nurgiartiningsih, MSc 5. Dr. Ir. Herni Sudarwati, MS 6. Dr. Ir. Agus Budiarto, MS 7. Dr. Ir. Osfar Sjofjan, MSc, IPU, ASEAN Eng 8. Dr. Ir. Irfan H.Djunaidi., MSc, IPM,. ASEAN Eng 9. Dr. M. Halim Natsir, S.Pt., MP., IPM., ASEAN Eng 10. Ir. Nur Cholis, MS, IPM, ASEAN Eng 11. Asri Nurul H, SPt., MP., MSc

Introduction

This course studies statistics and experimental design to be applied in animal research. Practicum, individual and group assignments are given for the ability to conduct analysis and provide conclusions. Topics studied consist the function and role of statistics, continuous random probability distribution, regression and correlation, experimental design and introducing the use/application of statistical analysis programs.

1	**Objectives** (Explain general and specific course objectives)
	1. Students are able to determine the correct type of statistics 2. Students are able to calculate data from observations and experiments 3. Students are able to analyze and conclude calculation results
2	**Learning Strategy** (Describe the strategies used to achieve course objectives - CLO)
	The learning is conducted by: 1. Presenting of lecture material 2. Discussion of sample questions 3. group discussion 4. Giving practice questions 5. Quiz
3	**Lecture Management** (Explain the management of lectures: lectures, tutorials, practicum, assignments, major assignments etc.)
	The lecture is conducted by :

	1) Lecture: 100 minutes/ meeting (14 meetings) 2) Practicum 50 minutes/ meeting (14 meetings) 3) Structured Assignments and quizzes (1 time before and 1 time after Midterm Exam) 4) Attendance: 80% of total attendance
4	**Lecture Content** (explain its suitability with the applicable curriculum)
	The lecture materials consist of: 1. INTRODUCTION 2. Continuous random odds distribution 3. Chi square 4. T Student 5. Regression and Correlation 6. Introduction to Experimental Design 7. Completely Randomized Design (CRD) 8. Treatment Average Testing 9. Randomized Block Design (RBD) 10. Latin Square Design and Cross Over Design 11. Nested experiment 12. Variety Analysis 13. Transformations and Excell applications
5	**Lecture Participants** (explain the depiction about students)
	The participants in Applied Statistics and Experimental Design courses are students who are currently taking semester 4.
6	**Attendance** (% attendance of lecture; % attendance of student)
	Lecturers are required to be present 100% in the lecture process, whereas students have a maximum tolerance of 20% for absenteeism to be able to take the Final Semester Examination.
7	**Evaluation System** (explain about homework, quizzes, group assignments, practicum, etc.)
	Evaluation is conducted with: Quiz (5%) with weighted value CLO 1: 40%; CLO 2: 30%; CLO 3: 30% Structured tasks (5%) with weighted value CLO 1: 20%; CLO 2: 50%; CLO 3: 30% Practicum (30%) with weighted value CLO 1: 30%; CLO 2: 40%; CLO 3: 30% UTS (30%) with weighted score CLO 1: 20%; CLO 2: 50%; CLO 3: 30% UAS (30%) with weighted value CLO 1: 20%; CLO 2: 50%; CLO 3: 30%
8	**Class Observation** (explain important and interesting things that will be encountered during the lecture)

9	**Learning Outcomes** (explain about the achievement of the goals that have been set, also include the learning achievements that can be explained)
	1. Able to develop comprehensive insight and mindset according to the science and field of the animal industry (LO 4) 2. Able to show performance, both independently and in teamwork (inter- and multi-disciplinary), identify and analyze to solve problems in quality and measurable way (LO 11) 3. Able to design and conduct experiments, analyze and interpret data to make correct decisions in solving problems in the field of animal science, meet ethics, and have environmental insight (LO 12)
10	**Obstacle** (provide the depiction of the main obstacles to learning)
11	**Score Distribution** (provide the score distribution following the learning achievements of this course)
	Quiz (5%) with weighted value CLO 1: 40%; CPMK 2: 30%; CPMK 3: 30% Structured Task (5%) weighted score CLO 1: 20%; CLO 2: 50%; CLO 3: 30% Practicum (30%) with weighted score Of CLO 1: 30%; CLO 2: 40%; CLO 3: 30% Mid-Term (30%) weighted score1: 20%; CPMK 2: 50%; CLO 3: 30% Final Test (30%) with weighted score CLO 1: 20%; CLO 2: 50%; CLO 3: 30%
12	**Conclusion**
13	**Improvement Recommendations**
	Appendices:
	1. 2. etc.