	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Biology Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
biostatistics and biocomputers	8420502309	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	4	June 20, 2022

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Understand the objectives of statistics, types of data and scale data measurement in biology and educational research.
PO - 2	Understand the utilization of computers for statistics
PO - 3	Able to design research experiments and analyze collected data.
PO - 4	Able to apply transferable skills to develop eco-commitment in an effort to realize the character of Faith, Smart, Independent, Honest, Caring and Tough.
PO - 5	Able to draw conclusions based on statistical data analysis .

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4
PO-5

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																
PO-5																

Short Course Description	This course discusses the basics of biostatistics in practice and computer-based research, including data format and visualization, descriptive statistics including central tendency (mean, median, and mode), and spread (standard deviation, variation, IQR), normal distribution; hypothesis testing; analysis of variance, correlation-regression analysis, analysis of covariance, and nonparametric statistics. Lectures are delivered using a student-centered approach in practical activities and assignments, while practical work is carried out using computer programs. These two learning activities are carried out to facilitate students to work honestly and independently.

References

Main :

1. Hariani D, Ambarwati R, Purnama ER, 2019. Buku Ajar Mahasiswa: Biostatistika dan Biokomputer. Surabaya: Unesa Press

Supporters:

1. Kusriningrum-RS, 2008. Perancangan Percobaan. Surabaya: Airlangga University Press.
2. Gomez, K.A. 1984. Statistical Procedures for Agricultural Research, 2nd Edition. Wiley-Interscience
3. Snedecor, G.W. 1989. Statistical Methods Eighth Edition. Ames. Iowa State University Press.
4. Steel dan Torrie, 1996. Principle and Procedure Statistics: A Biometrical Approach. New York: McGraw Hill Book Comp

Supporting lecturer	Prof. Dr. Ir. Dyah Hariani, M.Si. Dr. Muji Sri Prastiwi, S.Pd., M.Pd. Erlix Rakhmad Purnama, S.Si., M.Si. Dr. Pramita Yakub, S.Pd., M.Pd. Putut Rakhmad Purnama, S.Si, M.Si.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1. Understand the meaning of statistics and its benefits. 2. Understand the concept of data and measurement scales.	1. Define the statistical term. 2. Explain the importance and benefits of statistics. 3. Explain the data type and data format. 4. Provide examples of each data type. 5. Define the type of scale/level of data measurement.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	The lecturer explained the Biostatistics study plan and learning activities using the case method learning model to provide real Biology research experience and its application in educational research. 2 X 50	-	**Material:** Introduction to Biostatistics **Library:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	0%
2	1. Become familiar with statistical programs such as Ms. Excel, SPSS, and R Studio. 2. Understand the data type and format.	1. Demonstrate the features of statistical programs such as Ms. Excel, SPSS, and R Studio. 2. Demonstrate import and export data to the statistical program	**Criteria:** Student's participation in Class **Form of Assessment** : Participatory Activities	Lecture explains and demonstrates the statistical programs such as Ms. Excel, SPSS, and R Studio. Lecture explains the basic features such as import and export data and how to interpret the output results 2 X 50		**Material:** Introduction to Biostatistics **Library:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	10%
3	1. Understand the basic concepts of data visualization. 2. Able to visualize data to any graph such as bar plot, scatter plot, line plot, box plot, etc.	1. Explain how to choose the most appropriate graph for our datasets. 2. Explain the different usage of each graph representing our dataset type. 3. Describe the common caveats you should avoid when making a graph.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concepts of data visualizations. Lecture demonstrates how to generate appropriate graphs and followed by students. 2 X 50		**Material:** Introduction to Biostatistics **Library:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	5%

4	1.1. Understand the concept of descriptive statistics: Measurement of central tendency, measurement of spread, and frequency table. 2.2. Able to use statistical tools to generate descriptive statistics	1.Explain the scope of descriptive statistics. 2.Explain how to measure central tendency (Mean, Median, and Mode) in single and grouped datasets. 3.Explain how to measure spread (Range, Standard Deviation, Variation, and IQR). 4.Explain how to make a frequency table.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concept of descriptive statistics including measurement of central tendency and spread. Lecture leads the student to exercise to analyze the descriptive statistics based on given datasets. 3 X 50		**Material:** Introduction to Biostatistics **Library:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	5%
5	1.Understand the concept of normal distribution, normality test, and student's t-test. 2.Able to use statistical tools to calculate normality test, and student's t-test.	1.Explain the concept of normal distribution and normality test. 2.Explain the purpose of student's t-test 3.Explain the normality test procedure. 4.Explain the student t-test procedure in paired and unpaired datasets. 5.Practice using statistical program to perform normality test and student t-test.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concept of normality test and student t-test and its application in biology and educational research. 3 X 50		**Material:** Normality Test, t Test **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	0%
6	1.Understand the concept of simple linear regression. 2.Able to use statistical tools to perform simple linear regression.	1.Explain the objective and procedure of simple linear regression. 2.Practice using statistical program to perform simple linear regression.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concept of simple linear regression and its application in biology and educational research. 3 X 50		**Material:** Simple Regression **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	10%
7	1.Understand the concept of multiple regression. 2.Able to use statistical tools to perform multiple regression.	1.Explain the objective and procedure of performing multiple regression. 2.Analyze data using multiple regression 3.Using Excel and SPSS to test multiple regression tests	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concept of multiple regression and its application in biology and educational research. 3 X 50		**Material:** Multiple Regression **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	0%

8	Midterm Exam		**Form of Assessment** : Test	- 3 X 50	-	**Material:** - **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	20%
9	1. Understand the concept of analysis of covariance (ANCOVA). 2. Able to use statistical tools to perform analysis of covariance (ANCOVA).	1. Explain the concept and objectives of analysis of covariance. 2. Explain the procedure to perform analysis of covariance. 3. Practice using statistical tools to perform analysis of covariance to given datasets.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains the basic concept of analysis of covariance (ANCOVA) and its application in biology and educational research. 3 X 50	-	**Material:** Covariance Analysis **Literature:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	10%
10	1. Understand the concept of single-factor experimental design: Completely Randomized Design (CRD) 2. Able to use statistical tools to perform one-way analysis of variance (ANOVA) data from CRD.	1. Design the experimental with single factor (CRD). 2. Analyze the collected dataset using analysis of variance (ANOVA). 3. Interpret the results of analysis. 4. Perform a post-hoc analysis and draw conclusions.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains and leads the class's discussion about single-factor experimental design (CRD) in biology and education research. 3 X 50	-	**Material:** 1-factor analysis of variance (CRD) **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	10%
11	1. Understand the concept of single-factor experimental design: Randomized Complete Block Design (RCBD) and Latin Square Design (LSD). 2. Able to use statistical tools to perform one-way analysis of variance (ANOVA) data from RCBD and LSD.	1. Design the experimental with single factor RCBD and LSD for biology and education research. 2. Analyze datasets using analysis of variance (ANOVA) 3. Interpret the results of analysis. 4. Perform a post-hoc analysis and draw conclusions.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Practice / Performance	Lecture explains and leads the class's discussion about single-factor experimental design (RCBD and LSD) in biology and education research. 3 X 50	-		5%

12	1. Understand the multiple-factor / factorial experimental design concept: Strip-plot and Split-plot design. 2. Able to use statistical tools to perform two-way analysis of variance (ANOVA) data from Strip-plot and Split-plot designs.	1. Distinguish the difference between Strip-plot and Split-plot experimental design. 2. Design the experimental with multiple factors (Strip-plot and Split-plot experimental design). 3. Analyze datasets using analysis of variance (ANOVA). 4. Interpret the results of analysis. 5. Perform a post-hoc analysis and draw conclusions.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Practice / Performance	Lecture explains and leads the class's discussion about multiple factor experimental design (Strip-plot and Split-plot design) in biology and education research. 3 X 50	-	**Material:** 2-factor analysis of variance (separate plot and strip plot) **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	5%
13	1. Understand the concept of non-parametric tests in statistics. 2. Understand the concept of the Wilcoxon signed-rank test. 3. Understand the concept of Spearman's Rank correlation coefficient. 4. Able to use statistical tools to perform non-parametric tests in statistics	1. Explain the types of non-parametric tests 2. Explain the requirement of the Wilcoxon signed-rank test. 3. Practice to perform Wilcoxon signed-rank test using statistical programs. 4. Explain the requirement of Spearman's Rank correlation coefficient. 5. Practice to perform Spearman's Rank correlation coefficient using statistical programs.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities	Lecture explains and leads the class's discussion about non-parametric tests in biology and education research. 3 X 50		**Material:** Wilcoxon Analysis **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	5%
14	1. Understand the concept of chi-squared test. 2. Able to use statistical tools to perform chi-squared test.	1. Compare the Chi-square test : Goodness of Fit & Contingency Table. 2. Practice Chi-square test : Goodness of Fit & Contingency Table using statistical programs.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities, Practice/Performance	Lecture explains and leads the class's discussion about chi-squared tests in biology and education research. 3 X 50	-	**Material:** Chi-Square Analysis **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	5%

15	1.Understand the concept of the Kruskal-Wallis test and the Friedman test. 2.Able to use statistical tools to perform the Kruskal-Wallis test and the Friedman test .	1.Compare the objectives between Kruskal-Wallis test and the Friedman test. 2.Practice to perform the Kruskal-Wallis test using statistical programs. 3.Practice to perform the Friedman test using statistical programs.	**Criteria:** Individual Assignment with proportion weight of 30%; Midterm exam 20%; Student's participation during class discussion 20%; and Final exam 30%. **Form of Assessment** : Participatory Activities, Practice/Performance	Lecture explains and leads the class's discussion about the Kruskal-Wallis test and the Friedman test biology and education research. 3 X 50		**Material:** Crusscal Wallis analysis and Friedman test **References:** *Hariani D, Ambarwati R, Purnama ER, 2019. Student Textbook: Biostatistics and Biocomputers. Surabaya: Unesa Press*	0%
16			**Form of Assessment** : Project Results Assessment / Product Assessment	Final Exam 2x50			10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	57.5%
2.	Project Results Assessment / Product Assessment	10%
3.	Practice / Performance	12.5%
4.	Test	20%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.