	Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Undergraduate Physics Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date
Statistics	4520102203	Compulsory Study Program Subjects	T=2 P=0 ECTS=3.18	4	August 16, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Eng. Evi Suaebah, M.Si., M.Sc	Prof. Dr. Munasir, S.Si., M.Si.	Prof. Dr. Munasir, S.Si., M.Si.

Learning model: Case Studies

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

PLO-8	Able to make decisions based on data and information in order to fulfill and evaluate responsibilities according to their duties.
PLO-10	Analyze physical systems by applying mathematics and computing/ICT tools.

Program Objectives (PO)

PO - 1	Have the ability to use physics concepts and appropriate mathematical/computational methods to obtain solutions to quantitative problems in physics
PO - 2	Have the ability to collect data and analyze data and prepare a coherent report on the findings
PO - 3	Using symbolic and numerical language creatively in describing natural processes and phenomena qualitatively and quantitatively.
PO - 4	Able to use the theory learned to solve related problems or problems related to physics and related sciences
PO - 5	Able to operate software or applications related to statistical data processing using a computer.

PLO-PO Matrix

P.O	PLO-8	PLO-10
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: Statistics is a science that studies how to collect data, process/group data, present data, analyze data, test hypotheses, how to draw conclusions. material studied includes descriptive statistics, probability and discrete/continuous probability distribution; inferential statistics which contains parameter estimation and hypothesis testing; data analysis with the SPSS program and related applications that will help the statistical data processing process.

References

Main :

1. Howell, D. C, 2010,Statistical Methods For Psychology,US : Wardsworth Learning
2. Sudjana, 1996,Metoda Statistika, Bandung : Tarsito
3. Sugiyono, 2009,Statistika untuk Penelitian,Bandung: Alfabeta
4. Sugiyono, 2010,StatistikNonparametrisuntuk Penelitian, Bandung. Alfabeta

Supporters:

1. https://www.kdnuggets.com/2020/06/8-basic-statistics-concepts.html
2. Peter Bruce and Andrew Bruce,2017, Practical Statistics for Data Scientists, USA;O'Reilly Media, Inc.
3. Weis, Neil A. 2012. Elementary Statistics. United State of America: Addison-Wesley
4. Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.

Supporting lecturer	Dr. Dwikoranto, M.Pd. Dr. Eng. Evi Suaebah, M.Si., M.Sc. Muhammad Nurul Fahmi, 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. Able to understand types of data, how to collect data, and be able to present data correctly according to interests 2. Able to differentiate between the meanings of population and sample 3. Be able to mention three ways of collecting data and checking data 4. Able to discuss and determine how to present data	1. Understand the meaning of statistics and statistics 2. Understand various types of statistical data 3. Distinguish between the meanings of population and sample 4. Mention three ways of collecting data 5. Mention three ways of checking data 6. Discuss how to present data	**Criteria:** non-test **Form of Assessment** : Participatory Activities	Offline Offline/Offline 2x50 discussion presentations		**Material:** □ Introduction □ Understanding statistics and statistical data □ Statistical data □ Population and samples □ Presentation of data **References:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** Introduction to basic statistics **Library:** *https://www.kdnuggets.com/...*	3%
2	Able to understand and create data presentations with frequency distribution lists and graphs	1. Create a frequency distribution list 2. Calculate relative frequency and cumulative frequency 3. Depicts histograms, polygons, and ogive 4. Explain population models	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline Offline/Offline 2x50 discussion presentations		**Materials:** • Frequency distribution lists and graphs • Making frequency distribution lists • Relative and cumulative frequency distributions • Histograms and polygons, ogives • Population methods **Reader:** *Sugiyono, 2009, Statistics for Research, Bandung: Alfabeta* **Material:** Frequency Distributions and Graphs **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.*	3%
3	Able to calculate the arithmetic mean, measure, harmonic, mode, quartile, decile, percentile, either for single data, or in the form of a frequency distribution list	1. Calculating the sample average or arithmetic average 2. Calculate the measuring average 3. Calculating the harmonic mean 4. Calculate the median mode 5. Calculates quartiles, quartiles, deciles, and percentiles	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline Offline/Offline 2x50 discussion presentations		**Material:** □ Central symptom size and location size □ Arithmetic average □ Measuring average □ Harmonic average □ Mode and median □ Quartiles, deciles and percentages **Reference:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet*	3%
4	Able to understand and calculate inter-quartiles, quartile deviations, average deviations, standard deviations, standard deviations, standard numbers and coefficients of variation.	1. Calculate between quartile rents and quartile deviations 2. Calculate the average deviation 3. Calculate the standard deviation or standard deviation 4. Calculate standard numbers and coefficient of variation	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline 2x50 discussion presentations		**Material:** □ Measures of deviation or dispersion □ Range, range between quartiles and quartile deviations □ Average deviation □ Standard deviation □ Standard numbers and deviation coefficients **Reference:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning*	3%

5	Can describe and calculate probability theory, expectations	1. Defining opportunities 2. Mentions 4 rules of chance 3. Calculating expectations	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline 2x50 discussion presentations		**Material:** □ Opportunity theory □ Definition of opportunity □ Several rules of opportunity □ Expectations **Library:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** Probability and Counting Rules **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.*	4%
6	Can describe and calculate binominal and moltinominal distributions, hypergeometric distribution, Poisson distribution, normal distribution, student distribution, Chi Square distribution, F distribution	1. Distinguish between binomial and multinomial distributions 2. Explain the hypergeometric distribution 3. Explain the Poisson distribution 4. Explain the normal distribution 5. Explain the distribution of students 6. Explain the Chi square distribution 7. Explain the F distribution	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline 2x50 Discussion Presentations		**Material:** • Probability distribution • Binominal and multinominal distribution • hypergeometric distribution, • Poisson distribution, • normal distribution, • student distribution, • Chi-Square distribution, F distribution **Library:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** The types of distribution **References:** *Weis, Neil A. 2012. Elementary Statistics. United States of America: Addison-Wesley*	4%
7	Can describe and explain sampling techniques	1. Explain the reasons for sempling 2. Make a sampling plan 3. Mention 5 sampling methods to obtain representative samples 4. Mentioning errors: sempling and non sempling	**Criteria:** 1. non-test 2. Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities	Offline/Offline 2x50 Discussion Presentations		**Material:** □ Sampling □ Reasons for sampling □ Sampling plan □ Several sampling methods to obtain a representative sample □ Mistakes: sampling and non-sampling **Reference:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** Sample Size **Bibliography:** *Peter Bruce and Andrew Bruce, 2017, Practical Statistics for Data Scientists, USA; O'Reilly Media, Inc.*	4%
8	1. Able to solve questions related to material from meetings 1 to 7 2. UTS	1. Solve questions related to material from meetings 1 to 7 2. Using software related to data processing using statistics	**Criteria:** Test **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Tests	Offline/Offline Test 2x50		**Material:** meeting material 1-7 **References:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** meeting material 1-7 **Bibliography:** *Sudjana, 1996, Statistical Methods, Bandung: Tarsito* **Material:** meeting materials 1-7 **References:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet* **Material:** meeting materials 1-7 **Bibliography:** *Peter Bruce and Andrew Bruce, 2017, Practical Statistics for Data Scientists, USA; O'Reilly Media, Inc.* **Material:** meeting material 1-7 **References:** *Weis, Neil A. 2012. Elementary Statistics. United States of America: Addison-Wesley*	20%

9	Able to describe and estimate average parameters and sample size differences	1.Identifying interpretations 2.Mention methods of estimating 3.Explain how to estimate 4.Calculating how to estimate 5.Determine the sample size	**Criteria:** 1.non-test 2.Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities	Offline/Offline Discussion Presentation 2x50		**Material:** estimating □ Estimating □ Methods of estimating □ Estimating the averageμ □ Estimating the proportion π □ Estimating the standard deviation σ □ Estimating the difference in means □ Estimating the difference in proportion □ Determining the sample size **References:** **Material:** The concept of estimating in statistics **Reference:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet*	3%
10	Able to describe and carry out prerequisite tests for normality, equality of two variants, homogeneity test	1.Applying a normality test to a set of data 2.Applying the equality test of two variants to a set of data 3.Applying the homogeneity of variance test to a number of populations	**Criteria:** 1.Non-test 2.Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline Discussion Presentation 2x50	2x50	**Material:** normality prerequisite test, similarity of two variants, homogonity test **Reference:** *Sugiyono, 2009, Statistics for Research, Bandung: Alfabeta* **Material:** Hypothesis Testing **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.*	4%
11	Able to carry out tests on data, average test hypotheses, two-party tests, one-party tests	1.Explain the steps for hypothesis testing 2.Carry out data tests to test hypotheses on average, proportion, two parties, right side and left side 3.Carry out data testing for variance testing 4.Carry out data tests for similarity and average tests 5.Carry out data tests for the equality test of two proportions 6.Carry out data tests to test the equality of two variants	**Criteria:** 1.non-test 2.Assignment portfolio assessment using SPSS or similar software **Form of Assessment** : Participatory Activities	Offline/Offline Discussion Presentation 2x50		**Material:** □ Prerequisite test □ Upper normality test □ Test of similarity of two variants □ Homogeneity test of population variances **References:** *Sudjana, 1996, Statistical Methods, Bandung : Tarsito* **Material:** Testing the Difference Between Two Means, Two Proportions, and Two Variances **References:** *Weis, Neil A. 2012. Elementary Statistics. United States of America: Addison-Wesley*	4%
12	Able to use the Chi, square statistical test for research data analysis	Chi square analysis for: 1. Moltinum data proportion test, 2, Poisson average similarity test, 3. Independence test between two factors, 4. Binum distribution goodness-of-fit test, Poisson distribution, normal, 5. Normality test	**Criteria:** non-test **Form of Assessment** : Participatory Activities	Offline/Offline 2x50		**Materials:** □ Proportion test of multi-nome data □ Poison average similarity test □ Independent test between two factors □ Conformance test of binonomic distribution, poison, normal, or normality test **References:** *Sudjana, 1996, Statistical Methods, Bandung : Tarsito* **Material:** Hypothesis testing **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.*	4%
13	Can use variance analysis techniques for research data	• Perform statistical analysis using variance analysis techniques	**Criteria:** non-test **Form of Assessment** : Portfolio Assessment	Offline/Offline Discussion Presentation 2x50		**Material:** One-way analysis of variance **References:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet* **Material:** Analysis of Variance **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.*	3%

14	Able to use regression analysis techniques to analyze research data	• Carrying out statistical analysis using Regression analysis techniques: 1. Functional relationships between variables, 2. Free hand method, 3. Least squares method for regression, . Multiple linear regression, 5. Regression linearity test	**Criteria:** Non-test **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline Discussion Presentation 2x50		**Material:** □ Regression analysis □ Functional relationships between variables □ Free hand method □ Least squares method for regression □ Multiple linear regression □ Regression linearity test **References:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet* **Material:** Correlation and regression **Bibliography:** *Peter Bruce and Andrew Bruce, 2017, Practical Statistics for Data Scientists, USA; O'Reilly Media, Inc.*	4%
15	Can use regression analysis techniques to analyze research data	• Carrying out statistical analysis using Regression analysis techniques: 1. Functional relationships between variables, 2. Free hand method, 3. Least squares method for regression, . Multiple linear regression, 5. Regression linearity test	**Criteria:** non-test **Form of Assessment** : Participatory Activities, Portfolio Assessment	Offline/Offline Discussion Presentation 2x50		**Material:** □ Regression analysis □ Functional relationships between variables □ Free hand method □ Least squares method for regression □ Multiple linear regression □ Regression linearity test **References:** *Sugiyono, 2010, Nonparametric Statistics for Research, Bandung. Alphabet*	3%
16	1.UAS 2.Able to solve physics questions using statistical methods according to the 9th to 15th meetings	Solve physics questions using statistical methods according to the 9th to 15th meetings	**Criteria:** Test **Form of Assessment** : Participatory Activities, Tests	Offline/Offline Test 2x50		**Material:** material 9-16 **References:** *Bluman, Allan G. 2011, Elementary statistics : a step by step approach 8th ed, Mc. Graww Hill.* **Material:** material 9-16 **References:** *Weis, Neil A. 2012. Elementary Statistics. United States of America: Addison-Wesley* **Material:** material 9-16 **References:** *Howell, D. C, 2010, Statistical Methods For Psychology, US : Wardsworth Learning* **Material:** material 9-16 **Reference:** *Sudjana, 1996, Statistical Methods, Bandung: Tarsito*	31%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	54.17%
2.	Portfolio Assessment	23.67%
3.	Test	22.17%
		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** ability in the process and student learning outcomes are specific and measurable statements that identify the ability 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.