MODUL ENVIRONMENTAL STATISTICS

MASTER PROGRAM OF ENVIRONMENTAL SCIENCE
SCHOOL OF POSTGRADUATED STUDIES
DIPONEGORO UNIVERSITY

Modul Description :

Modul design	Environmental Statistics
Modul level, if applicable	
Code, if applicable	P-CIL-8-103
Subtitles, if any	
Course, if applicable	
Semester(s) in which the Modulis taught	Semester 1
Modulresponsible*	Dr. Budi Warsito, S.Si, M.Sc
Teaching Lecturer	1. Dr. Budi Warsito, S.Si, M.Sc 2. Prof. Dr. dr. Sunarsih, M.Sc 3. Ferry Hermawan, ST., MT., PhD.
Language	*Indonesian and English*
Relationship with curriculum	
Type of teaching, hours of contact	*Lecture: 120 minutes* *Q&A: 20 minutes* *Discussion: 20 minutes* *Presentation: 20 minutes* *Individual Task: 36 minutes*
Workload	*(Estimated) workload, divided into contact hours (lectures, exercises, laboratory sessions, etc.) and personal study, including test preparation, specified in hours,[1]and overall.*
credit points	*2 credits / 4 ECTS*
Requirements according to the exam regulations	*Lecture attendance of at least 75%*
Recommended prerequisites	

*Advanced lecture material conducted by the main supervisor, co-supervisors and students refers to the research topic.

Modulethe desired learning objectives/outcomes	Students are able to process and analyze data related to the field of Environment by applying statistical methods. Able to apply the use of statistics in the field of Environment and master the concepts needed to analyze environmental problems
Fill	EnvironmentThe statistics course discusses the meaning of statistics, descriptive statistics, basic concepts of probability, probability distribution, theoretical distribution of random variables, theoretical distribution of continuous random variables, sampling distribution, estimation, single sample hypothesis testing, multiple sample hypothesis testing, some other inferential analysis, linear regression simple and correlation, and some non-parametric methods.
Study and examexam requirements and forms	• *Open the book and close the book* • *Multiple choice, case studies, interviews, practicals*
Media used	*Powerpoint, youtube, website*
Reference	1. Darma Budi., Statistical Research Using SPSS, Guepedia Publisher, Jakarta, 2021 2. Hek Kim Tan., Introduction to Statistics, Publisher of the Kita Write Foundation, Medan, 2021 3. Hadi, S., Statistics, Student Library, Yogyakarta, 2015. 4. Rohmad, and Supriyanto, Introduction to Statistics, Kalimedia, Yogyakarta, 2015 5. Spiegel MR, Statistics, Schaum Outline Series, Mc-Graw-Hill, New York, 1982. 6. Supranto J., Theory and Application of Statistics Volume 1, Erlangga, Jakarta, 2009. 7. Supranto J., Theory and Application of Statistics Volume 2, Erlangga, Jakarta, 2009. 8. Usman, H., and Akbar, PS, Introduction to Statistics, Earth Literacy, Jakarta, 2015

SEMESTER STUDY PLAN

Study program: Master of Environmental Science				**Faculty: School of Postgraduate**				
Subject:	**Environmental Statistics**		**Code: CIL-8-103**		**Credit: 2 (4 ECTS)**		**Smt:1**	
Supporting lecturer:	**1. Dr. Budi Warsito, S.Si, M.Si** **2.** Dr. Dra. Sunarsih, M. Si							
Learning Outcomes Subject:	Students are able to process and analyze data related to the environmental field by applying statistical methods. Ableto apply the use of statistics in the environmental field and master the concepts needed for analysis of environmental problems and environmental management systems;							
Short Description of Courses:	Environmental Statistics course discusses the meaning of statistics, descriptive statistics, basic concepts of probability, probability distribution, theoretical distribution of random variables, theoretical distribution of continuous random variables, sampling distribution, estimation, single sample hypothesis testing, multiple sample hypothesis testing, several other inferential analyzes, simple linear regression and correlation, and some non-parametric methods.							

1	2	3	4	5	6	7	
Week	**Final Ability of each learning stage**	**Study Materials/ Subjects**	**Learning methods**	**Workload**	**Student Learning Experience**	**Evaluation**	
						Criteria & Indicators	**Weight (%)**
1.	1. Knowing the plan learning and division of tasks 2. Knowing about matters relating to Environmental statistics courses	1. RPKPS, syllabus, rules lectures, and rules evaluation 2. Introduction : Definition of Statistics, Role of Statistics in the environment, Problem solving with Statistics, Role of	Explanatory presentation lesson plans and subject matter	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120minutes* • *Q&A: 20 minutes* • *Discussion : 20minutes* • *Presentation : 20minutes* • *Individual tasks :36 minutes/day* *(Self Work)*	College student shape group for distribution presentation	Presence	5

		Computers in Statistics					
2.	1. Able to present data graphically 2. Be able to calculate the measures of concentration: mean, median, mode, quartile, decile, percentile, etc. 3. Be able to calculate the size of the spread of standard deviation, variance, etc.	Descriptive Statistics: 1. Collection organizing and presenting data. 2. Distribution of frequency and graphic presentation 3. Centering size 4. Spread size 5. Moment, skewness and kurtosis	Lecturer presentations, student discussions, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activeness in Discussion • Accuracy • Explain the history of air pollution throughout the ages	5
3.	1. Able to define terminology is important in probability. 2. Able to understand and explain concepts about events conditional, free and mutually exclusive 3.Able to do Probability calculation correctly and precisely	The basic concept of probability: 1. Basic concepts and definitions 2. Probability of compound events 3. Enumeration technique (enumeration)	Lecturer presentations, student discussions, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	Listening, summarizing and asking questions, giving opinions, answering questions	Indicator • Presence • Question and answer	5
4.	1. Able to distinguish discrete and continuous random variables 2. Able to use probability distributionconcept 3. Able to use probability distribution	Probability distribution: 1. Random variable 2. Probability distribution discrete	Lecturer presentations, student discussions, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes*	Students take part in lecturer presentations and discussions as well as practice questions and do assignments	Indicator • Presence • Assignments and assessments exercise	5

	with parameters 4. Able to understand and using the concept of expected value (hope mathematics)	3. Probability distribution continuous 4. Probability distribution with parameters 5. Expected value (hope mathematics)		• *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*			
5.	1. Able to identify and calculate distribution discrete variable theoretical probability 2. Able to determine Descriptive statistics 3. Able to use discrete random variable theoretical distribution approach	Theoretical distribution of discrete random variables: 1. Bernoulli distribution 2. Binomial Distribution 3. Binomial Distribution negative 4. Geometric Distribution 5. Poisson distribution	Lecturer presentations, student discussions, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	Students take part in lecturer presentations and discussions as well as practice questions and do assignments	Indicator • Presence • Activity in • Discussion • Assignments and assessments Exercise • Quiz	5
6.	1. Able to identify and calculate distribution continuous variable theoretical probability 2. Able to determine Descriptive statistics 3. Able to use Continuous random variable theoretical distribution approach	Variable theoretical distribution continuous random: 1. Normal distribution (Gaussian) 2. Gamma Distribusi Distribution	Student discussion per group, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks :*	Listening, summarizing and asking questions, giving opinions, answering questions	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise	5

		3. Chi-Square Distribution 4. Exponential Distribution 5. Weibull distribution 6. Log Normal Distribution		*36 minutes/day (Self Work)*			
7.	1. Able to understand the need for a sampling 2. Able to understand the principle of central limit theorem on the sampling distribution 3. Able to explain the steps required to forma sampling distribution.	Sampling distribution: 1. Understanding and basic concepts 2.Distribution of mean sampling 3. Distribution of sampling proportion 4. Distribution of difference and addition sampling	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	College student follow the presentation lecturer and discussionas well as practice questions and	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise	5
8	**Mid Term Examination**	**Meeting Material 1-7**	**Independent Written Test**	**216 minutes of processing time or the equivalent of 0.25 ECTS**	**Students working on UTS questions**	**Quality of answers and timeliness of collection**	**10**
9.	1. Able to explain basic concepts estimation 2. Able to count mean estimate, percentage and population variance 3. Able to determine sample size	Estimate: 1. Understanding and concepts estimation basis 2. Estimated population mean 3. Estimated percentage population	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise	5

		4. Estimated variance population 5. Size determination sample		• *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*			
10	1. Able to explain steps hypothesis test procedure 2. Able to count and analyze test single sample hypothesis	Sample hypothesis test single: 1. General test procedure hypothesis 2. Test the sample hypothesis single means 3. Test the single sample hypothesis percentage 4. Test the single sample variance hypothesis 5. P value on the test hypothesis	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise	5
11.	1. Able to understand goal and To do test procedure hypothesis 2. Able to do the calculation that required use test sample hypothesis	Multiple sample hypothesis test: 1. Test the variance hypothesis with multiple samples 2. Test the mean hypothesis with multiple samples	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise • Quiz	5

	double	3. Test the percentage hypothesis with multiple samples		• *Individual tasks : 36 minutes/day (Self Work)*			
12.	.. Able to explain and use test anova 2. Able to explain and using the chi-square test	A number of analysis other inferential: .. Analysis of Variance (ANOVA) . Chi-Square Test . Function alignment test . Contingency table test	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise • Quiz	5
13.	.. able to explain and interpret regression equation linear . able to count and explain correlation coefficient and coefficient determination	Linear Regression and Correlation simple : .. Simple linear regression analysis . Test the relation and prediction interval . Linear correlation analysis simple	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	College student follow the presentation lecturer and discussionas well as practice questions and carry out a task	Indicator • Presence • Activity in • Discussion • Assignments and assessments exercise	5
14.	1. Being able to know the situation that need method use non-parametric	Some non-parametric methods :	Lecturer presentation, discussion student, practice questions	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes*	College student follow the presentation lecturer and discussionas well as practice questions and	Indicator • Presence • Activity in • Discussion	5

	2. Able use test non-parametric	1. The significance of the method non-parametric 2. Test sign 3. Wilcoxon marked rating test 4. The Mann-Whitney Test 5. Kruskal-Wallis test 6. Spearman rank correlation coefficient		• *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	carry out a task	• Assignments and assessments exercise • Quiz	
15.	Capable apply theory statistics on problems in the field Environmental Science	Applications Statistics in the field LH	Student presentation and discussion	216 Minutes (0.25 ECTS) Consist of: • *Lecture : 120 minutes* • *Q&A: 20 minutes* • *Discussion : 20 minutes* • *Presentation : 20 minutes* • *Individual tasks : 36 minutes/day (Self Work)*	Students play an active role in looking for case studies in the field of Engineering The environment that Need troubleshooting with statistics, present in front of theclass and discussion.	Indicator • Presence • Paper • activeness in discussion	5
16	**Final Examination**	**Meeting Materials 1-15 (resume material)**	**Written test**	**216 minutes of processing time or the equivalent of 0.25 ECTS**	**Students working on UAS questions**	**Quality of answers and timeliness of collection**	**20**

8. Reference List:	1. Hadi, S., Statistics, Student Library, Yogyakarta, 2015. 2. Harinaldi, Statistical Principles for Engineering and Science, Erlangga, Jakarta, 2005 3. Rohmad, and Supriyanto, Introduction to Statistics, Kalimedia, Yogyakarta, 2015 4. Spiegel MR, Statistics, Schaum Outline Series, Mc-Graw-Hill, New York, 1982. 5. Supranto J., Statistical Theory and Application Volume 1, Erlangga, Jakarta, 2009.