BRAWIJAYA UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF PLANT PESTS AND DISEASES / MASTER OF AGRICULTURAL ENTOMOLOGY STUDY PROGRAM

SEMESTER COURSE PLAN

COURSES	CODE	CLUSTERS OF COURSES	CREDITS	SEMESTER	Date of Preparation
Ecological Statistics	PTH82229	Agricultural Entomology	3 4.15 ECTS	odd	June 8, 2021

AUTHORIZATION	Developer Lecturer	Course Coordinator	Head of Study Program
Department of Plant Pests and Diseases	Dr. Akhmad Rizali, SP, MSi Dr. AgrSc. Hagus Tarno SP, MP	Name Signature	Akhmad Rizali, SP, M.Si, Ph.D Signature

Learning Outcomes	ILO STUDY PROGRAM	
	S1	Able to work together and have social sensitivity and high concern for the community and the environment
	P1	Mastering concepts, theories and methods in the field of agricultural entomology

	U1	Have the skills to manage research in the field of inter/multidisciplinary agricultural entomology
	U2	Have skills in contributing to problem solving in society through research design in the field of agricultural entomology
	K1	Have skills in developing innovations and applications that are tested for problem solving in the community in the field of agricultural entomology in an inter/multidisciplinary manner within the framework of sustainable agriculture
	COURSE LEARNING OUTCOME	
	1	Able to understand the basic analysis used in ecological research and able to use R statistical software to conduct analysis
	2	Able to conduct biodiversity analysis and multivariate analysis to determine the pattern of interaction between biodiversity components and the relationship between biodiversity and the relationship between biodiversity and their environment
Brief Description of COURSE		
Learning Material / Subject	1) Introduction to Ecological Statistics (library, 1,2,3 following others) 2) Get to know R Statistics and Data Input 3) Basic Statistics and Statistical Modeling 4) Regression Analysis 5) Variety Analysis and Post Hoc 6) Multiple Regression Analysis 7) GLM Analysis 8) Spatial Pattern Analysis (library 3 and 4) 9) Species Estimation (libraries 3 and 4) 10) Diversity Index (library 3 and 4) 11) Species Composition Index and Similarity Analysis (library 3 and 4) 12) Multivariate Analysis: Dendogram and NMDS	

<table>
<tr><td></td><td>13) Multivariate Analysis: PCA and CCA
14) Non Parametric Analysis</td></tr>
<tr><td>Relationship of CLO and ILO</td><td>
<table>
<tr><th></th><th>A1</th><th>K1</th><th>K2</th><th>K3</th><th>S1</th><th>S2</th><th>S3</th></tr>
<tr><td>CLO 1</td><td>0.25</td><td>0.25</td><td>0</td><td>0</td><td>0.25</td><td>0.25</td><td>0</td></tr>
<tr><td>CLO 2</td><td>0</td><td>0.25</td><td>0</td><td>0</td><td>0.25</td><td>0.25</td><td>0.25</td></tr>
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</td></tr>
<tr><td rowspan="4">Reference</td><td>Main</td></tr>
<tr><td>1) Ludwig JA, Reynold JF. 1988. Statistical Ecology. Wiley
2) Crawley MJ. 2012. The R Book. 2nd Edition. Wiley
3) Borcard D, Gillet F, Legendre P. 2011. Numerical Ecology with R. Springer
4) Magurran AE. 1988. Ecological Diversity and Its Measurement. Springer
5) Zuur AF, Ieno EN, Walker N, Saveliev AA, Smith GM. 2009. Mixed Effects Models and Extensions in Ecology with R. Springer</td></tr>
<tr><td>Supporting references</td></tr>
<tr><td>1) Tarno H, Setiawan Y, Wang J, Ito S, Mario MB, Kurahman T, Suraningwulan M, Amaliah AA, Sari NI, Achmad MA, 2022. Partitioning of Ambrosia Beetle Diversity on Teak Plantations in Java, Sumbawa, and Sulawesi Islands. Forests, 13(12): 2111.</td></tr>
<tr><td rowspan="2">Learning Media</td><td>Software:</td><td>Hardware:</td></tr>
<tr><td>R Statistic and R Studio</td><td>Computer, LCD</td></tr>
<tr><td>Team Teaching</td><td colspan="2">Dr. Akhmad Rizali, SP, MSi
Dr. AgrSc. Hagus Tarno SP, MP</td></tr>
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Required Courses	1) Statistics

Week	Sub-CLO (as expected final capability)	Indicators	Criteria & Forms of Assessment	Learning Methods (Lectures / Assignments / other forms of learning)	Time (Duration)	Learning Materials / [References]	Proportions (%)
1	Understand the scope of material in ecological statistics	Ability to respond to learning materials, participate in learning activities and skills to explain ecological statistics	Criteria: Students' ability to explain and understand the scope of material in ecological statistics Form of Assessment: ability to respond and play an active role in discussions	Face to face and discussion	100 minutes	Introduction (Introduction to ecological statistics and quantitative ecology)	5 %
2	Students are able to understand community ecology data	Ability to respond to learning materials, participate in learning activities and skills to explain community	Criteria: Students' ability to understand and explain community ecology data	Lectures, discussion and practice	100 minutes	Community ecology data	

		ecological data and carry out tasks	Assessment form: Quizzes and assignments				
3	Understand spatial pattern analysis including statistical distribution and dispersion index	Ability to respond to learning material, follow learning activities and skills to explain spatial pattern analysis	Criteria: Students' ability to practice spatial pattern analysis: statistical distribution and dispersion index Assessment form: Quizzes and assignments	Lectures, discussion and practice	100 minutes	Spatial pattern analysis	
4	Understand the analysis of the relationship of species richness to abundance	Ability to respond to learning materials, participate in learning activities and skills to identify OPT and carry out tasks	Criterion: Able to measure and compile criteria and indicators of HPT aspects, including: population dynamics of microflora and mesofauna in relation to pest and disease management Form of assessment:	Lectures, discussion and practice	100 minutes Self-study (2x60 minutes): soil formation process	Criteria and indicators of HPT aspects, including: population dynamics of microflora and mesofauna in relation to pest and disease management	

			Quizzes and assignments				
5	Understand the analysis of the relationship of species richness with abundance using diversity indices	Ability to respond to learning materials, participate in learning activities and skills to identify OPT and carry out tasks	Able to identify, measure and compile criteria about plant production process components and plant aspect indicators Form of assessment: Quizzes and assignments	Lectures, discussion and practice	100 minutes Self-study (2x60 minutes):	Criteria and indicators of plant aspects, including: plant growth patterns, plant biodiversity, planting patterns, and crop production	
6	Understand interspecies linkage analysis	Ability to respond to learning materials, participate in learning activities and skills to identify OPT and carry out tasks	Able to plan and manage biotic and abiotic environmental factors Form of assessment: Quizzes and assignments	Lectures, discussion and practice	560 minutes	Management of biotic environmental factors – abiotic (understanding, problems and management), especially Land and Water Management (dry and wet land)	
7	Understand interspecies linkage analysis			Lectures, discussion and practice			
8	UTS	Ability to respond to learning	Able to plan and manage biotic	Lectures, discussion and practice	560 minutes	Management of biotic	

		materials, participate in learning activities and skills to identify OPT and carry out tasks	and abiotic environmental factors Form of assessment: Quizzes and assignments			environmental factors – abiotic (understanding, problems and management), especially Land and Water Management (dry and wet land)	
9	Understand community classifications	Ability to respond to learning materials, participate in learning activities and skills to identify OPT and carry out tasks	Able to plan and manage biotic and abiotic environmental factors Form of assessment: Quizzes and assignments	Lectures, discussion and practice	560 minutes	Analysis of management success from social, environmental and economic aspects	
10	Understand multivariate analysis and community ordination using dendrograms and NMDS	Ability to respond to learning materials, participate in learning activities and skills to identify OPT and carry out tasks	Able to plan and manage biotic and abiotic environmental factors Form of assessment: Quizzes and assignments	Lectures, discussion and practice	560 minutes	Case studies of failed agroecosystems include: integrated crop management, integrated pest management, and integrated soil fertility management	
11	Understand multivariate analysis and community			Lectures, discussion and practice			

	ordination using PCA and CCA						
12	Understand linear models for ecological data			Lectures, discussion and practice			
13	Understand non-linear models for ecological data			Lectures, discussion and practice			
	Understanding ecological series data			Lectures, discussion and practice			
14	Understand community interpretation			Lectures, discussion and practice			