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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Numerical Taxonomy*	4620102179	Study Program Elective Courses	T=2	P=0	ECTS=3.18	6	October 25, 2022

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Novita Kartika Indah, S.Pd.,M.Si.	Dr. Wisanti	Dr. H. Sunu Kuntjoro, S.Si., M.Si.

Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-7	Able to work independently and collaboratively, as well as responsibly, in completing various tasks in class, in the laboratory and in the field.
	PLO-9	Able to work independently in the laboratory and develop relevant skills by applying bioethics and work safety
	Program Objectives (PO)	
	PO - 1	Mastering the concept of solving taxonomic problems by conducting phenetic analysis (Knowledge)
	PO - 2	Mastering computing technology to apply the concept of phenetic analysis (Knowledge)
	PO - 3	Able to design, manage, analyze, interpret and document and store numerical taxonomy research data (Skills)
	PO - 4	Able to apply the concepts of phenetic and phylogenetic analysis logically and critically to describe plant diversity (Skill)
	PO - 5	Able to work independently and responsibly in compiling numerical taxonomy research
	PLO-PO Matrix	

P.O	PLO-7	PLO-9
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	Study the development of taxonomy, taxonomic evidence and character selection in solving plant diversity problems using numerical methods which include measuring the degree of similarity, Principal Component Analysis, Cluster Analysis and their relationship to phenetic, phylogenetic and cladistic kinship analysis using computational methods. Lectures are delivered through presentations, discussions, assignments, demonstrations, practice and reflection.
References	**Main :**

1. Davis, P.H., Heywood, V.H. 1973. Principles of Angiosperm Taxonomy . New York: Robert E Krieger Publishing Company
2. Kitching, I.J, Forey, P.L., Humphries, C.J., Williams, D.M. 1998. Cladistics: The Theory and Practice of Parsimony Analysis, Second Edition . London: Oxford University Press
3. Putri, E.K., 2013. Leaf Flushing as Taxonomic Evidence of Some Diospyros Species . Tesis tidak dipublikasikan.
4. Radford, A.E. 1986. Fundamentals of Plant Systematics . New York: Harper & Row Publisher Inc.
5. Stace, C.A. 1980. Plant Taxonomy and Biosystematics: Second Edition . London: Hodder & Stoughton
6. Stuessy T.F. 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data . New York: Columbia University Press

	Supporters:	
	1. Jeruti, P., Arama,P., Anyango, B., Taracha, R. N. C. T., Opiyo, S. 2017. Morphometric Study of Senna didymobotrya (Fresen.) H.S. Irwin and Barneby in Kenya. Journal od Natural Sciences Research 7(6): 54-69. 2. . Ogie-odia, E. A., Ehilen, O. E., Oloruntobi, F., Imagodo, E. 2019. Numerical Taxonomic Study of Some Euphorbiaceae Species Within Ambrose. Journal of Research in Forestry, Wildlife & Environment, 11(4): 178-187.	
Supporting lecturer	Dr. Wisanti, M.S. Dr. Novita Kartika Indah, S.Pd., M.Si. Eva Kristinawati Putri, S.Pd., 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	Understand the development of taxonomy	1.Formulate the role of taxonomy in the case of variations in living things 2.Explains the development of taxonomic science from conventional to modern	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests	Lectures, assignment discussions Lecturers discuss the development of the 2 X 50 taxonomy	Lectures, discussions on assignments 2 X 50	**Material:** The role of taxonomy in the case of variations in living things & the development of taxonomy from conventional to modern **References:** *Davis, PH, Heywood, VH 1973. Principles of Angiosperm Taxonomy. New York: Robert E Krieger Publishing Company*	5%
2	Understand various taxonomic evidence	Explain taxonomic evidence	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Project Results Assessment / Product Assessment	assignment discussion (phenetic kinship analysis project for certain types and regions) Lecturer discusses various taxonomic evidence 2 X 50	Presentation, discussion of assignments (phenetic kinship analysis projects for certain types and regions)	**Material:** Taxonomic Evidence **Bibliography:** *Davis, PH, Heywood, VH 1973. Principles of Angiosperm Taxonomy. New York: Robert E Krieger Publishing Company*	5%

3	Plan the resolution of taxonomic cases using appropriate taxonomic evidence	Identify appropriate taxonomic evidence for a particular case	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20% 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Project Results Assessment / Product Assessment	1. The lecturer presents a journal-based problem that will be solved in groups. 2. The problems raised are contextual. Students can find problems themselves in the journal. The lecturer organizes students to study, read and do work, and this is written in the LKPD. The lecturer ensures that each group member understands their respective assignments. 3. The lecturer monitors the discussion and guides the work on the LKPD so that each group's work is ready to be presented. 4. The lecturer guides the presentation and encourages groups to give awards and input to other groups. The lecturer and students conclude the material. 2 X 50	2 X 50 assignment discussion lecture	**Material:** Appropriate taxonomic evidence for certain cases & taxonomic cases and determining the most appropriate taxonomic evidence as a solution. **References:** *Radford, AE 1986. Fundamentals of Plant Systematics. New York: Harper & Row Publishers Inc.*	5%
4	Understand character selection for classification	Identify the appropriate character for a particular case	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	assignment discussion lecture 1. Lecturer divides the class into several small groups 2. Give case study questions 3. Lecturer instructs each group to discuss the answers to the questions 4. Lecturer ensures that each member actively participates in the discussion 5. Lecturer instructs each group to present the results of the discussion in the class 6 forum. Lecturer clarified, concluded and followed up 2 X 50	2 X 50 assignment discussion lecture	**Material:** Various characters in plants **Reference:** *Stace, CA 1980. Plant Taxonomy and Biosystematics: Second Edition. London: Hodder & Stoughton*	5%

5	Understand the measurement of degree/coefficient of similarity	Explain the measurement of the degree/coefficient of similarity	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion lectures , assignments Discussion between lecturers and students regarding measuring the degree/coefficient of similarity Discussion between lecturers and students regarding measuring the degree/coefficient of similarity 2 X 50	Discussion lecture , 2 X 50 assignments	**Material:** Measurement of the degree/coefficient of similarity **References:** *Jeruti, P., Arama, P., Anyango, B., Taracha, RNCT, Opiyo, S. 2017. Morphometric Study of Senna didymobotrya (Fresen.) HS Irwin and Barneby in Kenya. Journal od Natural Sciences Research 7(6): 54-69.*	5%
6	Understanding Principal Components Analysis (PCA)	1.Explain Principal Components Analysis (PCA) and its interpretation 2.Analyzing PCA	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, A 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions, assignments 1. Discuss the definition, how to interpret and factor analysis of PCA 2. Practice compiling PCA interpretations from related journals 3. Discuss appropriate morphological characters to complete the assignment 1. Discuss the definition, how to interpret and factor analysis of PCA 2. Practice compiling PCA interpretation from related journals 3. Discuss the appropriate morphological characters to complete the 2 X 50 task	Presentations, discussions, assignments	**Material:** Definition of PCA, How to do PCA, and Analyzing PCA **References:** *Jeruti, P., Arama, P., Anyango, B., Taracha, RNCT, Opiyo, S. 2017. Morphometric Study of Senna didymobotrya (Fresen.) HS Irwin and Barneby in Kenya. Journal od Natural Sciences Research 7(6): 54-69.*	5%
7	1.Understand cluster analysis and the resulting trees 2.Interpreting trees resulting from cluster analysis	1.Explaining cluster analysis 2.Interpreting trees resulting from cluster analysis	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions, assignments 1. Discuss the definition of clusters and clustering techniques 2. Practice interpreting trees resulting from cluster analysis 3. Discuss the characterization for the 2 X 50 task		**Material:** Cluster Analysis **Bibliography:** *Stace, CA 1980. Plant Taxonomy and Biosystematics: Second Edition. London: Hodder & Stoughton*	5%
8	MIDTERM EXAM	MIDTERM EXAM	**Criteria:** Attached **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests	MID SEMESTER EXAMINATION 2 X 50			15%

9	Understanding phenetic relationships	Explain phenetic relationships	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions, assignments 2 X 50		**Material:** Phenotic kinship relationships **References:** *Jeruti, P., Arama, P., Anyango, B., Taracha, RNCT, Opiyo, S. 2017. Morphometric Study of Senna didymobotrya (Fresen.) HS Irwin and Barneby in Kenya. Journal od Natural Sciences Research 7(6): 54-69.*	5%
10	Carrying out phenetic kinship analysis	1.Using the NTSys pc2.11 program for phenetic relationship analysis 2.Determining problems for project tasks	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentation, demonstration, practice 2 X 50		**Material:** Carrying out phenetic relationships with NTSyst **Library:** *Stuessy TF 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data. New York: Columbia University Press*	5%
11	Carrying out phenetic kinship analysis	1.Prepare a phenetic kinship analysis report 2.Communicate phenetic kinship analysis reports	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentation, discussion 1. Watch a demonstration of using the Clad 97 program for phenetic kinship analysis 2. Practice using the Clad 97 program for phenetic kinship analysis 3. Practice and discuss analyzing phenetic kinship 2		**Material:** How to analyze phenetics **Bibliography:** *Stace, CA 1980. Plant Taxonomy and Biosystematics: Second Edition. London: Hodder & Stoughton*	5%
12		Explain phylogenetic relationships	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	1. Watch a demonstration of using the NTSys pc2.11 program for cladistic kinship analysis 2. Practice using the NTSys pc2.11 program for cladistic kinship analysis 3. Practice and discuss analyzing cladistic kinship 2		**Material:** Cladistics **Bibliography:** *Kitching, IJ, Forey, PL, Humphries, CJ, Williams, DM 1998. Cladistics: The Theory and Practice of Parsimony Analysis, Second Edition. London: Oxford University Press*	5%

13		Translating phylogenetic relationships	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20% 3.USS weight 20% 4.US weight 30% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	1. Assigning Project Tasks 2. Designing plans for the project 3. Developing a project implementation schedule (Drafting a project completion timeline) 2 X 50		**Material:** Project Assignment **Library:** *Stuessy TF 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data. New York: Columbia University Press*	5%
14	Understanding cladistic kinship relationships	1.Explain the definition of a cladogram 2.Translating kinship relationships into cladograms	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions, assignments and reflections 2 X 50		**Material:** Project Assignment **Library:** *Stuessy TF 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data. New York: Columbia University Press*	10%
15	Presenting the research design	Using the PAUP program for cladistic kinship analysis	**Criteria:** 1.Reports and products are assessed as ASSIGNMENTS with a weight of 30%, 2.Student activities and responses during learning activities are assessed as PARTICIPATION with a weight of 20%, 3.USS weight 20% **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	6. Guide the project presentation process and respond to the results of completed student projects. 7. Finally, it is time for lecturers and students to carry out an evaluation, namely by reflecting and making 2 X 50 conclusions		**Material:** Project Assignment **Library:** *Stuessy TF 1990. Plant Taxonomy: The Systematic Evaluation of Comparative Data. New York: Columbia University Press*	5%
16			**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Tests				10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	40%
2.	Project Results Assessment / Product Assessment	50%
3.	Test	10%
		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.