	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
Laboratory Engineering Practicum	4620101199		T=0	P=1	ECTS=1.59	1	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	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**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

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

Short Course Description	Laboratory engineering practicum trains students to recognize and use various observation, measurement and analysis tools in the field of biology. Practical study of laboratory techniques is accompanied by various process skills that will be used to solve problems in the field of laboratory management and its applications. This course is presented through presentations, discussions and assignments.
References	**Main :**

1. Budipramana, L.S. dan J.D. Budiono. 1993. Teknik Laboratorium. Surabaya
   Haven, Mary C., Gregory A.Tetrault, Jerald R.Schenken.1995. Laboratory instrumentation. New York: John Wiley&Sons Inc.
   Singer, Donald C. 2001. A laboratory quality handbook of best practices. United states of America: ASQ Quality Press.

	Supporters:
Supporting lecturer	Prof. Dr. Mahanani Tri Asri, M.Si. Prof. Dr. Yuliani, M.Si. Dr. H. Sunu Kuntjoro, S.Si., M.Si. Lisa Lisdiana, S.Si., M.Si., Ph.D.

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 function and principles of using a microscope to support the implementation of experiments in the field of biology	1.Mention the components that make up a microscope and their functions 2.Explain the working principle of a microscope 3.Skilled in using a microscope 4.Describe the steps for maintaining a microscope	**Form of Assessment** : Participatory Activities	Presentations, discussions, observations and assignments 3 X 50			5%
2	Understand the function and principles of using a pH meter to support the implementation of experiments in the field of biology	1.Mention the types of pH meters and their applications 2.Explain the working principle of a pH meter 3.Skilled in using a pH meter 4.Describe the steps for maintaining a pH meter	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
3	Understand the function and principles of using conductivity meters to support the implementation of experiments in the field of biology	1.Mention the components that make up a conductivity meter and their functions 2.Explain the working principle of a conductivity meter 3.Skilled in using a conductivity meter 4.Describe the steps for maintaining a conductivity meter	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
4	Understand the function and principles of using a luxmeter to support the implementation of experiments in the field of biology	1.Mention the components that make up a luxmeter and their functions 2.Explain the working principle of a luxmeter 3.Skilled in using a luxmeter 4.Describe the steps for maintaining a luxmeter	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
5	Understand the function and principles of using a DO meter to support the implementation of experiments in the field of biology	1.Mention the components that make up a DO meter and their functions 2.Explain the working principle of a DO meter 3.Skilled in using a DO meter 4.Describe the steps for maintaining a DO meter	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%

6	Understand the function and principles of using turbidimeters and water samplers to support the implementation of experiments in the field of biology	1. Mention the components that make up a turbidimeter and water sampler and their functions 2. Explain the working principles of turbidimeters and water samplers 3. Skilled in using a turbidimeter and water sampler 4. Describe the steps for maintaining a turbidimeter and water sampler	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
7	Understand the function and principles of using a refractometer to support the implementation of experiments in the field of biology	1. Mention the components that make up a refractometer and their functions 2. Explain the working principle of a refractometer 3. Skilled in using a refractometer 4. Describe the steps for maintaining a refractometer	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
8	U.S.S	Skilled in using basic instruments for experiments in the field of biology, especially ecology	**Form of Assessment** : Participatory Activities, Tests	2 X 50			10%
9	Understand the function and principles of using a respirometer to support the implementation of experiments in the field of biology	1. Mention the components that make up a respirometer and their functions 2. Explain the working principle of a respirometer 3. Skilled in using a respirometer 4. Describe the steps for maintaining a respirometer	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
10	Understand the function and principles of using a hemocytometer to support the implementation of experiments in the field of biology	1. Mention the components that make up a hemocytometer and their functions 2. Explain the working principle of a hemocytometer 3. Skilled in using a hemocytometer 4. Describe the steps for caring for a hemocytometer	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
11	Understand the function and principles of using a spectrophotometer to support the implementation of experiments in the field of biology	1. Mention the components that make up a spectrophotometer and their functions 2. Explain the working principle of a spectrophotometer 3. Skilled in using a spectrophotometer 4. Describe the steps for maintaining a spectrophotometer	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%

12	Understand the function and principles of using centrifuges to support the implementation of experiments in the field of biology	1.Mention the components that make up a centrifuge and their functions 2.Explain the working principle of a centrifuge 3.Skilled in using a centrifuge 4.Describe the steps for centrifuge maintenance	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
13	Understand the function and principles of using laminar air flow to support the implementation of experiments in the field of biology	1.Mention the components that make up laminar air flow and their functions 2.Explain the working principle of laminar air flow 3.Skilled in using laminar air flow 4.Describe the steps for laminar air flow treatment	**Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, discussions, observations and assignments 3 X 50			5%
14	Understand the function and principles of using autoclaves to support the implementation of experiments in the field of biology	1.Mention the components that make up an autoclave and their functions 2.Explain the working principle of an autoclave 3.Skilled in using an autoclave 4.Describe the steps for autoclave maintenance	**Form of Assessment** : Participatory Activities	Presentations, discussions, observations and assignments 3 X 50			10%
15	Understand the function and principles of using a rotary evaporator to support the implementation of experiments in the field of biology	1.Mention the components that make up a rotary evaporator and their functions 2.Explain the working principle of a rotary evaporator 3.Skilled in using a rotary evaporator 4.Describe the maintenance steps for a rotary evaporator	**Form of Assessment** : Participatory Activities, Practical Assessment	Presentations, discussions, observations and assignments 3 X 50			10%
16	US	Skilled in using basic instruments for experiments in the field of biology, especially in the fields of physiology, microbiology and biotechnology	**Form of Assessment** : Participatory Activities	2 X 50			10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	35%
2.	Project Results Assessment / Product Assessment	55%
3.	Practical Assessment	5%
4.	Test	5%
		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.