



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

**Document Code**

**SEMESTER LEARNING PLAN**

<b>Courses</b>	<b>CODE</b>	<b>Course Family</b>	<b>Credit Weight</b>	<b>SEMESTER</b>	<b>Compilation Date</b>																																	
Applied Biology	4620102032		T=2 P=0 ECTS=3.18	7	July 17, 2024																																	
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>		<b>Study Program Coordinator</b>																																	
	.....		.....		Dr. H. Sunu Kuntjoro, S.Si., M.Si.																																	
<b>Learning model</b>	<b>Project Based Learning</b>																																					
<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>																																					
	<b>PLO-6</b>	Able to apply logical, critical, systematic and innovative thinking in the context of developing or implementing science and/or technology according to their field of expertise.																																				
	<b>PLO-11</b>	Able to apply transferable skills in biology to develop ecopreneurship (eco-innovation, eco-opportunity, eco-commitment)																																				
	<b>PLO-13</b>	Able to demonstrate basic knowledge of cell and molecular biology, organismal biology, ecology and evolution to analyze current biological issues																																				
	<b>Program Objectives (PO)</b>																																					
	<b>PLO-PO Matrix</b>																																					
	<table border="1" style="margin: auto;"> <tr> <td style="width: 20%;"></td> <td style="width: 20%;">P.O</td> <td style="width: 20%;">PLO-6</td> <td style="width: 20%;">PLO-11</td> <td style="width: 20%;">PLO-13</td> </tr> </table>						P.O	PLO-6	PLO-11	PLO-13																												
	P.O	PLO-6	PLO-11	PLO-13																																		
<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																						
	<table border="1" style="margin: auto;"> <tr> <td rowspan="2" style="width: 5%;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 5%;">1</td> <td style="width: 5%;">2</td> <td style="width: 5%;">3</td> <td style="width: 5%;">4</td> <td style="width: 5%;">5</td> <td style="width: 5%;">6</td> <td style="width: 5%;">7</td> <td style="width: 5%;">8</td> <td style="width: 5%;">9</td> <td style="width: 5%;">10</td> <td style="width: 5%;">11</td> <td style="width: 5%;">12</td> <td style="width: 5%;">13</td> <td style="width: 5%;">14</td> <td style="width: 5%;">15</td> <td style="width: 5%;">16</td> </tr> </table>					P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																						
<b>Short Course Description</b>	Applied Biology discusses the application and utilization of Biological science (Plants, Animals, Microbiology) in the form of products and services to meet human needs, analysis and solutions to problem solving in the field of Biology and its applications. Applied Biology studies are accompanied by various process skills (minds on activity and hands on activity) which will be used to solve problems in the field of Biology and used to train students to apply biological knowledge in environmentally conscious entrepreneurship. Learning is delivered through presentations, discussions, assignments and projects.																																					
<b>References</b>	<b>Main :</b>																																					
	<ol style="list-style-type: none"> <li>1. Handbook of prebiotics and probiotics ingredients : health benefits and food applications. Editors, Susan Sungsoo Cho and E. Terry Finocchiaro. 2010. CRC Press. Printed in the United States of America on acid-free paper</li> <li>2. Huner, J.V. and H.K. Dupree. 1984. Methods and economics of channel catfish production, and Techniques for the culture of flathead catfish and other catfishes. From the Third Report to the Fish Farmers. U.S. Department of the Interior. Fish and Wildlife Service. Pp. 44-82. www.kyagr.com/.../AQ_Aquacultureplan. Diakses 21 April 2016</li> <li>3. Nino, B. 2013. Probiotics, prebiotics and the gut microbiota. International Life Sciences Institute Europe Concise Monograph Series. Printed in Belgium.</li> <li>4. Somerville, C. .Cohen, M. Pantanella. E. Stankus. A. and Lovatelli. A. 2014. Small-scale aquaponic food production. Integrated fish and plant farming. Food and Agriculture Organization of The United Nations. Rome.</li> <li>5. Sonaiya, E.B. and Swan, S.E.J. Small-scale poultry production. technical guide. Food and Agriculture Organization of the United nations..Rome. 2004</li> <li>6. Taiz, L. dan Zeiger, E. 2010. Plant Physiology. California: The Benjamin/Cummings Publishing Company, Inc</li> </ol>																																					
	<b>Supporters:</b>																																					
<b>Supporting lecturer</b>	Prof. Dr. Ir. Dyah Hariani, M.Si. Prof. Dr. Mahanani Tri Asri, M.Si. Prof. Dr. Yuliani, 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 meaning and scope of applied bio and bioethics	a. Explain the meaning of applied biology b. Explain the scope of applied biology and its relationship with other biological sciences c. Explain the meaning and principles of bioethics d. Explain the importance of bioethics in handling and utilizing biological objects e. Explain the reasons why it is important to pay attention to bioethical principles in handling and utilizing biological objects.	<b>Criteria:</b> 1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2. USS/UTS weight 20% 3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4. US weight 30% 5. Essay and multiple choice questions are assessed jointly on USS and US 6. Performance questions are integrated during learning  <b>Form of Assessment :</b> Participatory Activities	Presentation and discussion. 2 X 50			5%
2	Understand the role of microbes-bacteria in Biological products	a. Explain the importance of microbes and bacteria in various biological products b. Give examples of biological products that use microbes c. Analyze the function of various bacteria in various Biological products d. Explain the mechanism of action of bacteria on one of the Biological products e. Create a report on search results for articles about biological products that use microbes	<b>Criteria:</b> 1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2. USS/UTS weight 20% 3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4. US weight 30% 5. Essay and multiple choice questions are assessed jointly on USS and US 6. Performance questions are integrated during learning  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentations, discussions and assignments 2 X 50			0%

3	Understand the role of microbes-fungi/yeast in Biological products	<p>a. Explain the importance of fungal/yeast microbes in various biological products b. Give examples of Biological products that use microbes-fungi/yeast c. Analyzing the function of various fungi/yeasts in various Biological products d. Explain the mechanism of action of fungi/yeast on one of the Biological products e. Create a report on search results for articles about biological products that use microbes-fungi/yeast</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentations, discussions and assignments 2 X 50			0%
4	Linking the concept of microbes to the production of environmentally friendly probiotics	<p>a. Explain the meaning of probiotics b. Identifying ingredients and microbes for making probiotics c. Explain the mechanism of action of probiotics in aquaponics e. Skilled in making probiotics</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and practicum on probiotics 2 X 50			3%

5	Understand the role of aquatic plants and apply them in biological products that are environmentally friendly	<p>a. Explain the importance of plants in various biological products b. Give examples of biological products (feed, fertilizer, food) that use plants c. Analyzing the functions of various plants in various Biological products d. Explain the mechanism of action of aquatic plants on one of the Biology products-aquaponics e. Create a report on search results for articles about biological products that use aquatic plants f. Describe the factors that influence the success of biological products derived from plants g. Determine the aquatic plants that will be used as aquaponic plants-food plants h. Create test results reports.</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and practicum on probiotics 2 X 50			2%
6	Understand the role of land plants in environmentally sound biological products	<p>a. Describe the benefits of terrestrial plants in various environmentally friendly biological products b. Give examples of biological products (feed, fertilizer, food) that use terrestrial plants c. Analyzing the functions of various terrestrial plants in various Biological products d. Explain the mechanism of action of land plants on one of the Biology products- e. Create a report on the aquaponics design that will be carried out</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion, practicum 2 X 50			0%

7	Linking the role of plants and probiotics in Biological products	a. Analyze the relationship between plants and microbes in an ecosystem b. Explain the role of plants and microbes in an aquaponic system c. Relating the role of probiotics as nutrients for plants in aquaponic systems	<b>Criteria:</b> 1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2. USS/UTS weight 20% 3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4. US weight 30% 5. Essay and multiple choice questions are assessed jointly on USS and US 6. Performance questions are integrated during learning  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentations, discussions and project assignments 2 X 50			0%
8	USS material 1 to 7	-	<b>Criteria:</b> 1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2. USS/UTS weight 20% 3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4. US weight 30% 5. Essay and multiple choice questions are assessed jointly on USS and US 6. Performance questions are integrated during learning  <b>Form of Assessment :</b> Participatory Activities	-- 2 X 50			10%

9	Understand the benefits of animals and apply them in environmentally friendly aquatic animal biology products	<p>a. Describe the benefits of aquatic animals in various environmentally friendly biological products b. Determine the biological products of aquatic animals to be cultivated c. Determine and prepare components for cultivating aquatic animals and aquatic plants (aquaponics) d. Assembling components for aquaponic cultivation e. Implementing environmentally friendly aquaponics projects f. Aquatic animal article search assignments related to aquaponics assignments</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and implementation of the 2 X 50 project			0%
10	Understand the benefits of animals and apply them in environmentally friendly land animal biology products	<p>a. Describe the benefits of land animals in various environmentally friendly biological products b. Determine which land animal biological products will be cultivated c. Determine and prepare components for land animal cultivation d. Assembling components for environmentally friendly land animal cultivation e. Applying environmentally friendly land animal projects f. Article search assignments related to assignments</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and implementation of the 2 X 50 project			0%

11	Linking the use of probiotics in the cultivation of aquatic animals and aquatic plants (aquaponics) in an environmentally sound manner	<p>a. Explain the role of probiotics and animals in polyculture cultivation (aquaponics) b. Linking the use of probiotics in aquaponic cultivation environments and adding them to feed as fermented feed for aquatic animals c. Mechanism of adding probiotics to improve the quality of aquaculture waters d. Mechanism of adding probiotics to feed as fermented feed to increase feed efficiency and growth in animal aquaculture and plant cultivation e. Observing the project f. Assignment: article review: The relationship between animals and probiotics in polyculture cultivation</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and implementation of the 2 X 50 project			5%
12	Integrating Biology elements in Ecopreneur	<p>a. Integrating Biology elements in Ecopreneur b. Determining biological elements in the environment by utilizing agricultural waste in a broad sense, integrated with the use of probiotics into several products and as a source of bioenergy c. Explain the process of integrating Biology elements in Ecopreneur d. Observing the project e. Assignment: search for articles related to the integration of biological elements in ecopreneurship</p>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and implementation of the 2 X 50 project			5%

13	Analyze the water quality in the aquaponic ecosystem	a. Water quality analysis b. Communicate experimental results	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	2 X 50 project assignment presentation			10%
14	Analyzing plant growth which is influenced by animal and microbial factors	a. Analyzing plant growth b. Communicate experimental results	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2. USS/UTS weight 20%</li> <li>3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4. US weight 30%</li> <li>5. Essay and multiple choice questions are assessed jointly on USS and US</li> <li>6. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	2 X 50 project assignment presentation			10%



15	Analyzing animal growth which is influenced by plant and microbial factors	a. Analyzing animal growth b. Communicating experimental results c. Skilled in compiling project assignment reports	<b>Criteria:</b> 1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2. USS/UTS weight 20% 3. Student activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4. US weight 30% 5. Essay and multiple choice questions are assessed jointly on USS and US 6. Performance questions are integrated during learning  <b>Form of Assessment :</b> Participatory Activities	2 X 50 project assignment presentation			10%
16			<b>Form of Assessment :</b> Participatory Activities				10%

#### Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	55%
2.	Project Results Assessment / Product Assessment	15%
		70%

#### Notes

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Forms of assessment:** test and non-test.
- 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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.