



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

Document
Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date
Plant Structure and Development	8420504226	Compulsory Study Program Subjects	T=4 P=0 ECTS=6.36	3	April 27, 2023
AUTHORIZATION	SP Developer		Course Cluster Coordinator		Study Program Coordinator
	Dr. Rinie Pratiwi Puspitawati, M.Si.		Dr. Rinie Pratiwi Puspitawati, M.Si.		Dr. Rinie Pratiwi Puspitawati, M.Si.

Learning model	Project Based Learning
----------------	------------------------

Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																	
	PLO-7	Able to demonstrate knowledge of biology at the molecular, cell and organism levels and their interactions with the environment.																																
	PLO-11	Able to demonstrate knowledge of biology at the molecular, cell and organism levels and their interactions with the environment																																
	Program Objectives (PO)																																	
	PO - 1	Understand the concept of plant cells while mastering problem solving skills to conduct studies of plant cells regarding their function and role.																																
	PO - 2	Understand the concept of plant tissue while mastering problem-solving skills to carry out studies of plant tissue regarding their function and role.																																
	PO - 3	Understand the concept of morphological characteristics of plant stems while mastering problem solving skills to conduct studies of the morphological characteristics of plant stems related to their function and external environment.																																
	PO - 4	Understand the concept of plant stems while mastering problem solving skills to study the anatomical structure of stems related to their function and external environment.																																
	PO - 5	Understand the concept of morphological characteristics of plant roots while mastering problem solving skills to conduct studies on the morphological characteristics of plant roots related to their function and external environment.																																
	PO - 6	Mastering problem solving skills to study the anatomy of plant roots regarding their function and role.																																
	PO - 7	Understand the concept of morphological characteristics of plant leaves while mastering problem solving skills to conduct studies on the morphological characteristics of plant leaves related to their function and external environment.																																
	PO - 8	Mastering problem solving skills to conduct studies on plant leaves regarding their function and role.																																
	PO - 9	Understand the concept of flower morphological characters																																
	PO - 10	Understand the concept of morphological characteristics of plant fruit and seeds while mastering problem solving skills to study the morphological characteristics of fruit and seeds related to their function and external environment.																																
	PLO-PO Matrix																																	
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">P.O</th> <th style="width: 15%;">PLO-7</th> <th style="width: 15%;">PLO-11</th> </tr> </thead> <tbody> <tr><td>PO-1</td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td></tr> <tr><td>PO-5</td><td></td><td></td></tr> <tr><td>PO-6</td><td></td><td></td></tr> <tr><td>PO-7</td><td></td><td></td></tr> <tr><td>PO-8</td><td></td><td></td></tr> <tr><td>PO-9</td><td></td><td></td></tr> <tr><td>PO-10</td><td></td><td></td></tr> </tbody> </table>		P.O	PLO-7	PLO-11	PO-1			PO-2			PO-3			PO-4			PO-5			PO-6			PO-7			PO-8			PO-9			PO-10		
P.O	PLO-7	PLO-11																																
PO-1																																		
PO-2																																		
PO-3																																		
PO-4																																		
PO-5																																		
PO-6																																		
PO-7																																		
PO-8																																		
PO-9																																		
PO-10																																		
PO Matrix at the end of each learning stage (Sub-PO)																																		

	<table border="1"> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> <tr><td>PO-1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	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																	PO-6																	PO-7																	PO-8																	PO-9																	PO-10																
			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																																																																																																																																																																																																										
		PO-6																																																																																																																																																																																																										
		PO-7																																																																																																																																																																																																										
		PO-8																																																																																																																																																																																																										
PO-9																																																																																																																																																																																																												
PO-10																																																																																																																																																																																																												

Short Course Description This course studies groups of open-seeded and closed-seeded plants in terms of external structure (morphology), internal structure (anatomy) and their development related to various external factors. The study includes the concept of structure and function of cells, tissues and organs that make up the Organum Nutritivum and Organum Reproductivum. This course is presented through theory and practice with emphasis on the process of solving problems related to the concepts studied. At the end of the lecture, students master knowledge related to the concept of plant development structure while also having relevant problem solving skills.

References

Main :

- Bell, A.D. 1991. Plant Form. An Illustrated Guide to Flowering Plant Morphology. Oxford University Press. New York.
- Bendre, A. dan A. Kumar. 1980. A Textbook of Practical Botany . Rastogi Publications. New Delhi
- Cutler, D.F. Botha, C.E.J. & Stevenson, D.W. 2007. Plant Anatomy An Applied Approach. New York. Blackwell Publishing.
- Esau, K. 1965. Plant Anatomy . John Wiley & Sons, New York, Toronto.
- Fahn, A. 1985. Plant Anatomy .Pergamon Press. New York, Toronto, Sidney
- Hidayat, E.B. 1994. Morfologi Tumbuhan . Jakarta: DEPDIBUD. Direktorat Jenderal pendidikan Tinggi, Proyek Pendidikan Tenaga Akademik

Supporters:

- Pratiwi, R. 2018. Anatomi Tumbuhan. Surabaya. Universitas Negeri Surabaya Press
- Schweingruber, F.H. Borner, A. & Schulze, E-D. 2011. Atlas of Stem Anatomy in Herbs, Shrubs and Trees

Supporting lecturer Dr. Rinie Pratiwi Puspitawati, M.Si.
 Dr. Novita Kartika Indah, S.Pd., M.Si.
 Ahmad Bashri, S.Pd., M.Si.
 Sari Kusuma Dewi, S.Si., M.Si.
 Dr. Yustina Carolina Febrianti Salsinha, S.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	<p>1.Relate cell structures to tissues related to their functions and roles.</p> <p>2.Communicate specific cytological characteristics of plant cells related to plant cell function</p> <p>3.Identify problems related to plant cell structure related to cell function and role</p>	<p>1.1. Describe the parts that make up plant cells.</p> <p>2.2. describe the differences in the concepts of plastids, cell walls, and ergastic compounds</p> <p>3.3. Explain the relationship between specific cytological characteristics of plant cells and their role.</p> <p>4.4. Draw conclusions based on the collected facts regarding the specific cytological characteristics of plant cells</p>	<p>Criteria:</p> <p>1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores.</p> <p>2.Participation assessment is an assessment of attitudes.</p> <p>3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade</p> <p>Form of Assessment : Participatory Activities</p>	<p>1. Presentation and discussion with Small Group Discussion and Class Discussion</p> <p>2. Exploratory practicum with problem solving strategies regarding the cytological characteristics of plant cells related to their function 4 X 50</p>	<p>Material: Components of plant cells: 1. Protoplast. a. Cytoplasm b. Endoplasmic Reticulum c. Mitochondria d. Plastid e. Dictyosomes f. Cell nucleus 2. Vacuole 3. Ergastic substances a. Starch b. Crystals 4. Cell Walls</p> <p>Bibliography: <i>Hidayat, EB 1994. Plant Morphology. Jakarta: DEPDIKBUD. Directorate General of Higher Education, Academic Personnel Education Project</i></p> <hr/> <p>Material: Cell Wall</p> <p>Reference: <i>Pratiwi, R. 2018. Plant Anatomy. Surabaya. Surabaya State University Press</i></p> <hr/> <p>Material: Cell Walls</p> <p>References: <i>Schweingruber, FH Borner, A. & Schulze, ED. 2011. Atlas of Stem Anatomy in Herbs, Shrubs and Trees</i></p>	3%
---	---	--	---	--	--	----

2	<p>1.Relate the structure of various types of tissue to their function and role as structures that respond to the environment.</p> <p>2.Describe embryonal tissue as the initial tissue of the plant body</p> <p>3.Identify various types of vascular tissue and their logical reasons.</p> <p>4.Communicate plant tissue concepts related to their role and the environment in which they live.</p> <p>5.Identifying problems regarding plant tissue related to the morphological structure of plant organs</p>	<p>1.Describe embryonal tissue as the initial tissue of the plant body</p> <p>2.Explain basic networking concepts</p> <p>3.Explain the concept of periderm tissue</p> <p>4.Explain the concept of vascular tissue</p> <p>5.Explain epidermal tissue</p> <p>6.Identify parenchyma, chlorenchyma, collenchyma, sclerenchyma, aerenchyma tissue and their logical reasons</p> <p>7.Identify various types of vascular tissue and their logical reasons.</p> <p>8.Explain the relationship between plant tissue and its role and the environment in which it lives</p> <p>9.Draw conclusions based on collected facts about plant tissues regarding their role and the environment in which they live</p>	<p>Criteria:</p> <p>1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores.</p> <p>2.Participation assessment is an assessment of attitudes.</p> <p>3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade</p> <p>Form of Assessment : Participatory Activities</p>	<p>1. Exploratory practicum with problem solving strategies regarding the characteristics of plant tissues related to their function.</p> <p>2. Presentation discussion about the characteristics of plant tissue related to its function. 10 X 50</p>	<p>Material: Plant Embryonic Tissue: 1. Protoderm 2. Procambium 3. Basic Meristem</p> <p>References: <i>Hidayat, EB 1994, Plant Morphology. Jakarta: DEPDIKBUD. Directorate General of Higher Education, Academic Personnel Education Project</i></p> <hr/> <p>Material: Adult Tissue: 1. Basic Tissue • Parenchyma • Collenchyma • Chlorenchyma • Aerenchyma • Sclerenchyma 2. Vascular Tissue • Xylem • Phloem 3. Epidermis • Stomata • Trichomata</p> <p>References: <i>Fahn, A. 1985. Plant Anatomy .Pergamon Press. New York, Toronto, Sidney</i></p> <hr/> <p>Material: Vascular tissue: xylem and flem and mature or secondary tissue</p> <p>References: <i>Schweingruber, FH Borner, A. & Schulze, ED. 2011. Atlas of Stem Anatomy in Herbs, Shrubs and Trees</i></p>	3%
---	--	---	---	--	---	----

3	<p>1.Relate the structure of various types of tissue to their function and role as structures that respond to the environment.</p> <p>2.Describe embryonal tissue as the initial tissue of the plant body</p> <p>3.Identify various types of vascular tissue and their logical reasons.</p> <p>4.Communicate plant tissue concepts related to their role and the environment in which they live.</p> <p>5.Identifying problems regarding plant tissue related to the morphological structure of plant organs</p>	<p>1.Describe embryonal tissue as the initial tissue of the plant body</p> <p>2.Explain basic networking concepts</p> <p>3.Explain the concept of periderm tissue</p> <p>4.Explain the concept of vascular tissue</p> <p>5.Explain epidermal tissue</p> <p>6.Identify parenchyma, chlorenchyma, collenchyma, sclerenchyma, aerenchyma tissue and their logical reasons</p> <p>7.Identify various types of vascular tissue and their logical reasons.</p> <p>8.Explain the relationship between plant tissue and its role and the environment in which it lives</p> <p>9.Draw conclusions based on collected facts about plant tissues regarding their role and the environment in which they live</p>	<p>Criteria:</p> <p>1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores.</p> <p>2.Participation assessment is an assessment of attitudes.</p> <p>3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade</p> <p>Form of Assessment : Participatory Activities</p>	<p>1. Exploratory practicum with problem solving strategies regarding the characteristics of plant tissues related to their function.</p> <p>2. Presentation discussion about the characteristics of plant tissue related to its function. 10 X 50</p>	<p>Material: Plant Embryonic Tissue: 1. Protoderm 2. Procambium 3. Basic Meristem</p> <p>References: <i>Hidayat, EB 1994, Plant Morphology. Jakarta: DEPDIKBUD. Directorate General of Higher Education, Academic Personnel Education Project</i></p> <hr/> <p>Material: Adult Tissue: 1. Basic Tissue • Parenchyma • Collenchyma • Chlorenchyma • Aerenchyma • Sclerenchyma 2. Vascular Tissue • Xylem • Phloem 3. Epidermis • Stomata • Trichomata</p> <p>References: <i>Fahn, A. 1985. Plant Anatomy .Pergamon Press. New York, Toronto, Sidney</i></p> <hr/> <p>Material: Vascular tissue: xylem and flem and mature or secondary tissue</p> <p>References: <i>Schweingruber, FH Borner, A. & Schulze, ED. 2011. Atlas of Stem Anatomy in Herbs, Shrubs and Trees</i></p>	3%
---	--	---	---	--	---	----

4	<p>1. Apply telom theory to explain the development of microphylls and megaphylls.</p> <p>2. Explain the differences between the development of dicot stems and monocot stems.</p> <p>3. Conclude various results of trunk and branch modifications based on relevant facts.</p>	<p>1. Comparing the branching of true dichotomies with pseudo.</p> <p>2. Explain the development of microphylls and megaphylls</p> <p>3. Explain the differences between the development of dicot stems and monocot stems</p> <p>4. Identify the shape of the rod in relation to its function.</p> <p>5. Prepare reports on branching construction patterns along with logical reasons through exploration.</p> <p>6. Conclude various results of trunk and branch modifications based on relevant facts.</p> <p>7. Collect assignments on time</p> <p>8. Actively express opinions during discussions and presentations</p>	<p>Criteria:</p> <p>1. Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores.</p> <p>2. Participation assessment is an assessment of attitudes.</p> <p>3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<p>Practical exploration of the morphological characteristics of plant stems related to their function. Presentation discussion on the morphological characteristics of plant stems related to their function</p> <p>Designing a project to observe selected stem morphology in relation to special structures and environmental conditions 4 X 50</p>		<p>Material: Morphological structure of stems and stem modifications</p> <p>References: <i>Bell, AD 1991. Plant Form. An Illustrated Guide to Flowering Plant Morphology. Oxford University Press. New York.</i></p> <hr/> <p>Material: stem morphology observations along with stem modifications</p> <p>References: <i>Bendre, A. and A. Kumar. 1980. A Textbook of Practical Botany. Rastogi Publications. New Delhi</i></p>	10%
---	--	--	---	--	--	---	-----

5	Concludes changes in stem structure due to secondary growth processes.	<ol style="list-style-type: none"> 1. Comparing the branching of true dichotomies with pseudo. 2. Explain the development of microphylls and megaphylls 3. Explain the differences between the development of dicot stems and monocot stems 4. Identify the shape of the rod in relation to its function. 5. Prepare reports on branching construction patterns along with logical reasons through exploration. 6. Conclude various results of trunk and branch modifications based on relevant facts. 7. Collect assignments on time 8. Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2. Participation assessment is an assessment of attitudes. 3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<p>Exploratory practicum with problem solving strategies regarding the anatomy of plant stems related to their functions. Presentation discussion on the anatomical properties of plant stems related to their function. Develop a project design to explore the morphological and anatomical characteristics of stems with unique structures related to the conditions in which they live. At this 5th meeting the project design to explore the morphological and anatomical characteristics of stems was finalized and presented. Project activities in phase one of the 4 X 50 project</p>	<p>Material: anatomical structure of stems</p> <p>References: <i>Fahn, A. 1985. Plant Anatomy .Pergamon Press. New York, Toronto, Sidney</i></p> <hr/> <p>Material: anatomical structure of the stem</p> <p>References: <i>Schweingruber, FH Borner, A. & Schulze, ED. 2011. Atlas of Stem Anatomy in Herbs, Shrubs and Trees</i></p>	10%
---	--	---	--	--	---	-----

6	<p>Understand the concept of plant stems while mastering problem solving skills to study the anatomical structure of stems related to their function and external environment. Have a responsible, independent and honest attitude towards performance in lectures on the structure of plant development</p>	<ol style="list-style-type: none"> 1.Explain the concept of primary and secondary stem structure. 2.Identify the network that makes up the stem along with its logical reasons. 3.Presenting the results of studies on the anatomical structure of stems related to their adaptation to the environment 4.Designing solutions to problems related to the anatomical structure of stems as a form of adaptation to the environment. 5.Prepare problem solving reports related to the anatomical structure of stems as a form of adaptation to the environment. 6.Be present on time according to the lecture schedule 7.Collect assignments on time 8.Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2.Participation assessment is an assessment of attitudes. 3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<p>Exploratory practicum with problem solving strategies regarding the anatomy of plant stems related to their function. Presentation discussion on the morphological characteristics of plant stems related to their function. Presentation of the results of the practicum as a basis for preparing a project plan that will be completed until week 14. 4 X 50</p>			10%
---	--	---	---	---	--	--	-----

7	<p>Understand the concept of morphological characteristics of plant roots while mastering problem solving skills to conduct studies on the morphological characteristics of plant roots related to their function and external environment. Have a responsible, independent and honest attitude towards performance in lectures on the structure of plant development</p>	<ol style="list-style-type: none"> 1. Compare the processes of formation of tap and fibrous root systems. 2. Distinguish between the morphological structures of tap roots and fiber roots. 3. Identify the types of specialized roots (photosynthetic roots, suction roots, contractile roots, post roots, buttress roots, knee roots, and hanging roots, reproductive roots). 4. Present the function or role of specialized root types for these plants (photosynthetic roots, suction roots, contractile roots, peg roots, buttress roots, knee roots, and hanging roots, reproductive roots). 5. Write down the results of the study, a logical prediction of the process of forming specialized roots. 6. Be present on time according to the lecture schedule 7. Collect assignments on time 8. Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2. Participation assessment is an assessment of attitudes. 3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<p>Practical exploration of root morphology related to its function. Presentation discussion about the morphological characteristics of roots related to their function. Presentation discussion of project results related to stem studies related to environmental conditions 4 X 50</p>			10%
8	MIDTERM EXAM		<p>Form of Assessment : Test</p>	4 X 50			5%

9	<p>Mastering problem-solving skills to study the anatomy of plant roots related to their function and role. Having a responsible, independent and honest attitude towards performance in lectures on the structure of plant development</p>	<ol style="list-style-type: none"> 1. Describe the arrangement of tissues that make up primary and secondary roots 2. Identify the primary and secondary constituent tissues of monocot and dicot roots. 3. Explain the relationship between the structure of root tissue and its role. 4. Explain the process of secondary growth of roots. 5. Designing solutions to problems related to the anatomical structure of roots as a form of adaptation to the environment. 6. Prepare problem solving reports related to the anatomical structure of roots as a form of adaptation to the environment. 7. Be present on time according to the lecture schedule 8. Collect assignments on time 9. Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2. Participation assessment is an assessment of attitudes. 3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	<p>Exploratory practicum with problem solving strategies regarding the anatomy of plant roots related to their function Presentation discussion on the anatomical properties of roots related to their function Designing a project to study the special morphological structure of roots related to environmental conditions 4 X 50</p>	<p>Material: Morphological structure and root modification References: <i>Cutler, DF</i> <i>Botha, CEJ & Stevenson, DW 2007. Plant Anatomy An Application Approach. New York. Blackwell Publishing.</i></p> <hr/> <p>Material: Morphological structure and root modification References: <i>Bell, AD 1991. Plant Form. An Illustrated Guide to Flowering Plant Morphology. Oxford University Press. New York.</i></p>	10%
---	---	--	--	--	---	-----

10	<p>Mastering problem solving skills to study the anatomy of plant roots related to their function and role; Having a responsible, independent and honest attitude towards performance in lectures on the structure of plant development</p>	<ol style="list-style-type: none"> 1. Describe the arrangement of tissues that make up primary and secondary roots; 2. Identify the primary and secondary constituent tissues of monocot and dicot roots; 3. Explain the relationship between root tissue structure and its role; 4. Explain the process of secondary growth of roots; 5. Designing solutions to problems related to the anatomical structure of roots as a form of adaptation to the environment; 6. Prepare problem solving reports related to the anatomical structure of roots as a form of adaptation to the environment; 7. Be present on time according to the lecture schedule; 8. Collect assignments on time; 9. Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Assessment is based on benchmarks (PAP); The assessment components consist of sub-summative, assignment, summative and participation grades; 2. Participation assessment is an assessment of attitudes; 3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	<p>Exploratory practicum with problem solving strategies regarding plant root anatomy related to its function; Presentation discussion on the anatomical properties of roots related to their function Presentation of project results which have been prepared in the form of a 4 X 50 E-poster</p>			5%
----	---	--	---	--	--	--	----

11	Understand the concept of morphological characteristics of plant leaves while mastering problem solving skills to conduct studies on the morphological characteristics of plant leaves related to their function and external environment. Have a responsible, independent and honest attitude towards performance in lectures on the structure of plant development	<ol style="list-style-type: none"> 1.Explain the process of leaf formation. 2.Describe the morphological characteristics of leaves 3.Presents the explored leaf phyllotaxis 4.Describe leaf modifications 5.Explain the logical relationship between modified leaf structure and its role and habitat conditions. 6.Be present on time according to the lecture schedule 7.Collect assignments on time 8.Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2.Participation assessment is an assessment of attitudes. 3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	Exploration of leaf morphology related to its function. Presentation discussion on the morphological characteristics of leaves related to their function 4 X 50			5%
12	Mastering problem solving skills to study the anatomy of plant leaves related to their function and role. Having a responsible, independent and honest attitude towards performance in lectures on the structure of plant development	<ol style="list-style-type: none"> 1.Describe the arrangement of leaf tissues. 2.Explain the relationship between leaf tissue structure and its role and habitat. 3.Designing solutions to problems related to the anatomical structure of roots as a form of adaptation to the environment. 4.Prepare problem solving reports related to the anatomical structure of roots as a form of adaptation to the environment 5.Be present on time according to the lecture schedule 6.Collect assignments on time 7.Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2.Participation assessment is an assessment of attitudes. 3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	4 X 50	<ol style="list-style-type: none"> 1. Discuss the preparation of a plan to observe the anatomy of plant leaves regarding their function and habitat. 2. Work in groups to explore solving problems regarding the anatomy of plant leaves related to their function and habitat. 3. Discussion and presentation of the results of solving problems regarding the anatomy of plant leaves related to their function and habitat. 4. Presentation of reflection results on the lecture process. 		5%

13	<p>Mastering problem solving skills to study the anatomy of plant leaves related to their function and role. Having a responsible, independent and honest attitude towards performance in lectures on the structure of plant development</p>	<ol style="list-style-type: none"> 1. Describe the arrangement of leaf tissues. 2. Explain the relationship between leaf tissue structure and its role and habitat. 3. Designing solutions to problems related to the anatomical structure of roots as a form of adaptation to the environment. 4. Prepare problem solving reports related to the anatomical structure of roots as a form of adaptation to the environment 5. Be present on time according to the lecture schedule 6. Collect assignments on time 7. Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1. Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2. Participation assessment is an assessment of attitudes. 3. Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	4 X 50	<ol style="list-style-type: none"> 1. Discuss the preparation of a plan to observe the anatomy of plant leaves regarding their function and habitat. 2. Work in groups to explore solving problems regarding the anatomy of plant leaves related to their function and habitat. 3. Discussion and presentation of the results of solving problems regarding the anatomy of plant leaves related to their function and habitat. 4. Presentation of reflection results on the lecture process. 		5%
----	--	--	---	--------	--	--	----

14	Understand the concept of flower morphological characters. Have a responsible, independent and honest attitude towards performance in lectures on the structure of plant development	<ol style="list-style-type: none"> 1.Explain the development of flowers. 2.Describe the parts that make up a flower. 3.Identify the parts that make up a flower. 4.Describe flower diagrams and formulas. 5.Identify different types of inflorescences. 6.Compare various types of flowers based on their pollination 7.Be present on time according to the lecture schedule 8.Collect assignments on time 9.Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2.Participation assessment is an assessment of attitudes. 3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	<p>Work in groups to explore the morphological characteristics of flowers related to their function.</p> <p>Discussion and presentation of exploration results regarding the morphological characteristics of flowers, flower formulas and diagrams.</p> <p>Presentation of reflection results on the lecture process 4 X 50</p>	<p>Material: Flower Structure Reference: <i>Bell, AD 1991. Plant Form. An Illustrated Guide to Flowering Plant Morphology. Oxford University Press. New York.</i></p> <hr/> <p>Material: Flower Structure References: <i>Bendre, A. and A. Kumar. 1980. A Textbook of Practical Botany. Rastogi Publications. New Delhi</i></p> <hr/> <p>Material: Flower structure Reference: <i>Hidayat, EB 1994. Plant Morphology. Jakarta: DEPDIKBUD. Directorate General of Higher Education, Academic Personnel Education Project</i></p> <hr/> <p>Material: 1. Plant development structure handout Chapter 9 regarding the morphology of plant flowers. 2. Student activity sheet about the morphology of plant flowers. 3. Textbook according to references on the morphology of plant flowers. 4. Specimens share flower types. 5. Power point slide about flower morphology and its modifications Reference: <i>Pratiwi, R. 2018. Plant Anatomy. Surabaya. Surabaya State University Press</i></p>	3%
----	--	--	--	--	--	----

15	Understand the concept of flower morphological characters. Have a responsible, independent and honest attitude towards performance in lectures on the structure of plant development	<ol style="list-style-type: none"> 1.Explain the development of flowers. 2.Describe the parts that make up a flower. 3.Identify the parts that make up a flower. 4.Describe flower diagrams and formulas. 5.Identify different types of inflorescences. 6.Compare various types of flowers based on their pollination 7.Be present on time according to the lecture schedule 8.Collect assignments on time 9.Actively express opinions during discussions and presentations 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.Assessment is based on benchmarks (PAP). The assessment components consist of sub-summative, assignment, summative and participation scores. 2.Participation assessment is an assessment of attitudes. 3.Performance assessment in the form of presentation performance is carried out integrated during learning as an assignment grade <p>Form of Assessment : Portfolio Assessment</p>	<p>Work in groups to explore the morphological characteristics of flowers related to their function.</p> <p>Discussion and presentation of exploration results regarding the morphological characteristics of flowers, flower formulas and diagrams.</p> <p>Presentation of reflection results on the lecture process 4 X 50</p>		3%
16			<p>Criteria: Written test</p> <p>Form of Assessment : Test</p>	Written Test (UAS)		10%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	9%
2.	Project Results Assessment / Product Assessment	50%
3.	Portfolio Assessment	26%
4.	Test	15%
		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.

