UNIVERSITAS SEBELAS MARET
FACULTY OF TEACHER TRAINING AND EDUCATION
BACHELOR OF BIOLOGY EDUCATION STUDY PROGRAM
Building D 3rd Floor FTTE UNS Jl Ir. Sutami No. 36 A Kentingan Surakarta 57126 Indonesia
E-mail: biologi@fkip.uns.ac.id; Website: https://biologi.fkip.uns.ac.id/en/

Plant Anatomy and Morphology

Undergraduate Programme In Biology Education **Module Handbook**

Module Name	Plant Anatomy and Morphology (Anatomi dan Morfologi Tumbuhan)
Module level	Undergraduate Programme
Course Code	02013143001
Abbreviation, if applicable	-
Courses included in the module, if applicable	-
Semester/Term:	1st
Module coordinator (s)	Dr Harlita, M.Si
Lecturer (s):	Dr. Muzzazinah, M.Si Nurmiyati, S.Pd, M.Si
Language:	Bahasa Indonesia (Indonesian Language)
Classification within the curriculum	Compulsory/~~Elective~~
Teaching format/class hours per week during the semester	• Direct instruction /flipped classroom (blended learning)/(2 x 50 x 16 / 60) 26.7 hours/week/semester; • Project-based activities/ (16 x 170 / 60) 45.33 hours/week/semester; • Tasks assignment/structured tasks/ (10 x 170 /60) 28.3 hours/week/semester ; • Self Study (4 x 60 x 2 sks) 8 hours/week/semester
Workload	
Credit Point:	3 CSU (4.5 ECTS)

Type	CSU	Face to Face	Structured Activities	Self-study
T	2	(26.7 h (1.109 ECTS)	28.3 h (1.176 ECTS)	8 h (0.33 ECTS)
P	1	45.33 h (1.88 ECTS)		
Total 3		108.33 h (4.5 ECTS)		

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Requirements:	-
Learning goals/competencies:	PLO 2 They are able to apply the basic advance knowledge in biology to solve the problem in biology. PLO 6 They are able to select and analyze the proper technology and information or data in accomplishing tasks. PLO 8 They are able to communicate verbal and nonverbal effectively using the proper media. PLO 10 They are able to demonstrate creativity, accuracy, discipline, responsibility, adaptability, have an independent initiative, autonomous learning, and do lifelong learning CLO 1 Analyze the morphological structure of organs in different plant groups through practicum activities and communicate the results (LO2, LO6, and LO 8) CLO 2 Analyze the anatomical structure of the organs in different plant groups through practicum activities and communicate the results (LO2, LO6, and LO 8) CLO 3 Analyze differences in the anatomy-morphological structure of plant organs in relation to their habitat and present them in the form of posters / charts (LO2, LO6, LO 8, and LO 10) CLO 4 Analyzing the relationship between living habitats and the anatomical structure and morphology of organs in plants and presenting the results (LO2, LO6, LO 8, and LO 10) **PLO And CLO Mapping** CLO/PLO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 CLO1 | | * | | | | * | | * | | | CLO2 | | * | | | | * | | * | | | CLO3 | | * | | | | * | | * | | * CLO4 | | * | | | | * | | * | | *

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<table>
<tr><td>Content:</td><td>Plant Anatomy and Morphology is a compulsory subject for a study program that examines:
1. Morphological structure of the thallophyta plant
2. The morphological structure of gymnosperms,
3. The morphological structure of the angiosperms,
4. Relationship of structure, function and habitat,
5. Cytology and structure of plant cells,
6. Characteristics and classification of plant tissues,
7. Anatomy of the higher vegetative organs of plants</td></tr>
<tr><td>Attribute Soft skill</td><td>1. Able to think conceptually, analytically, and logically
2. Have good communication skills</td></tr>
<tr><td>Study/exam achievements</td><td>Students are considered to complete the course and pass if they obtain at least 60% of maximum final grade. The final grade (FS) is calculated based on the following ratio:

<table><tr><th>Aspect</th><th>(%)</th></tr><tr><td>Task/quiz/presentation / laboratory activity</td><td>30</td></tr><tr><td>Participation</td><td>10</td></tr><tr><td>Mid-Term Test/ Team Based Project</td><td>30</td></tr><tr><td>Final Exam</td><td>30</td></tr><tr><td>Final Score</td><td>100</td></tr></table></td></tr>
<tr><td>Form of Media:</td><td>Powerpoint slide, plant specimen, video</td></tr>
</table>

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Literature (primary references):	1. Mabberley, D. J. 2017. *Mabberley's plant-book: a portable dictionary of plants, their classification and uses* (No. Ed. 4). Cambridge: Cambridge University Press. 2. Saxena, M. C. 2009. Plant morphology, anatomy and growth habit. *The lentil: Botany, production and uses. CABI, Oxfordshire, UK*, 34-46. 3. Lopez, F. B., & Barclay, G. F. 2017. Plant anatomy and physiology. In *Pharmacognosy* (pp. 45-60). UT: Academic Press. 4. Beck, C. B. 2010. *An introduction to plant structure and development: plant anatomy for the twenty-first century*. Cambridge: Cambridge University Press. 5. Beentje, H. J. 2010. *The Kew plant glossary: an illustrated dictionary of plant terms*. Sydeny: Royal Botanic Gardens. 6. Dos Santos, V. L. P., Raman, V., Bobek, V. B., Migacz, I. P., Franco, C. R. C., Khan, I. A., & Budel, J. M. 2018. Anatomy and microscopy of Piper caldense, a folk medicinal plant from Brazil. *Revista Brasileira de Farmacognosia*, *28*(1), 9-15. 7. Araujo, F. F., Santos, M. N., Costa, L. C., Moreira, K. F., Araujo, M. N., Martinez, P. A., & Finger, F. L. 2019. Changes on potato leaf metabolism and anatomy induced by plant growth regulators. *Journal of Agricultural Science*, *7*, 139. 8. Barupal, M., Kataria, V., & Shekhawat, N. S. 2018. In vitro growth profile and comparative leaf anatomy of the C 3–C 4 intermediate plant Mollugo nudicaulis Lam. *In Vitro Cellular & Developmental Biology-Plant*, *54*(6), 689-700. 9. Oguchi, R., Onoda, Y., Terashima, I., & Tholen, D. 2018. Leaf anatomy and function. In *The leaf: a platform for performing photosynthesis* (pp. 97-139). Springer, Cham. 10. Wang, J., Fu, G., Li, W., Shi, Y., Pang, J., Wang, Q., ... & Liu, J. 2018. The effects of two free-floating plants (Eichhornia crassipes and Pistia stratiotes) on the burrow morphology and water quality characteristics of pond loach (Misgurnus anguillicaudatus) habitat. *Aquaculture and Fisheries*, *3*(1), 22-29.

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Assessment

Presentation Assessment Rubric

Dimension	Weight (%)	Score	WxS	Comments
Material mastery	30			
The accuracy of solving the problem	30			
Communication skills	20			
Ability to deal with questions	10			
Props/presentations	10			
Final Score	100			

Dimension	Scale				
	Very Good	Good	Sufficient	Deficient	Very Deficient
	≥85	71-84	60-70	40-59	<40
Organisation	Well organized by presenting facts that are supported by examples that have been analyzed according to the concept	well organized and present convincing facts to support conclusions.	The presentation has focus and presents some evidence to support the conclusion	Sufficiently focused, but insufficient evidence to be used in drawing conclusions	There is no clear organization. Facts are not used to support statements.
Content	Content can inspire listeners to develop their minds.	Contents are accurate and complete. Listeners get new insights about the topic.	Content is generally accurate, but incomplete. Listeners can learn some implied facts, but they don't add new insight into the topic	The content is less accurate, because there is no factual data, it does not add to the listener's understanding	The content is inaccurate or too general. Listeners don't learn anything or are sometimes misled.
Presentation Style	Speak with passion, transmit enthusiasm and enthusiasm to listeners	The speaker is calm and uses proper intonation, speaks without relying on notes, and interacts intensively with the listener. The speaker always makes eye contact with the listener.	In general the speaker is calm, but with a flat tone and quite often relies on notes. Sometimes eye contact with the listener is ignored.	Based on the notes, no ideas are developed outside the notes, the sound is monotonous	The speaker is anxious and uncomfortable, and reads notes rather than speaking. Listeners are often ignored. There is no eye contact because the speaker is looking more at the whiteboard or screen.

PRACTICUM PERFORMANCE ASSESSMENT

Practicum Performance Observation Sheet

No	Name	Aspects of Performance Assessment										Total Score	Note
		1	2	3	4	5	6	7	8	9	10		
1													
2													
3													
4													
5													

Information:

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1 = Practical equipment
2 = Physical appearance readiness
3 = Interpret
4 = Predict
5 = Applying the concept
6 = Planning an experiment
7= Doing an experiment
8 = Communicate

Practicum Performance Assessment Rubric

No	Aspect	Criteria	Score
Preparation			
1	**Practical equipment**	Bring/prepare all (100%) tools and materials.	4
		Not bringing 25% of the total tools/materials or 25% of the total tools/materials not in accordance with the provisions.	3
		Not bringing 50% of the total tools/materials or 50% of the total tools/materials not in accordance with the provisions	2
		Not bringing 75% of the total tools/materials or 75% of the total tools/materials not in accordance with the provisions	1
2	**Physical appearance readiness**	Lab coat worn and neat appearance.	4
		Wearing a lab coat and looking untidy (wearing t-shirts, shorts, or not wearing shoes)	3
		Do not wear a lab coat and look presentable.	2
		Not wearing a lab coat and looking untidy (wearing t-shirts, shorts, or not wearing shoes).	1
Using tools and materials			
3	**Discipline of practical tools/materials**	All tools/materials are taken neatly and not scattered.	4
		25% of the total tools/materials were taken untidy and scattered.	3
		50% of the total tools/materials were taken untidy and scattered.	2
		75% of the total tools/materials were taken untidy and scattered.	1
4	**Appropriateness of practical tools/materials**	All tools/materials are taken as needed.	4
		Take 25% of the total tools/materials that are not as needed.	3
		Take 50% of the total tools/materials that are not as needed.	2
		Taking 75% of the total tools/materials that are not as needed.	1
5	**Correct operation of the tool**	All tools are operated properly.	4
		25% of the total tools are operated incorrectly.	3
		50% of the total tools are operated incorrectly.	2
		75% of the total tools are operated incorrectly.	1
6	**Practicum Procedure**	doing 100% practicum procedure correctly	4
		doing 75% practicum procedure correctly	3
		doing 50% practicum procedure correctly	2
		doing 25% practicum procedure correctly	1
Result			
7	**Practical result**	Using as many senses as possible in making observations and doing it carefully according to procedures	4
		Using few senses in making observations and doing it according to procedures	3
		Using as many senses as possible in making observations but not being thorough	2
		Observing the practical results at a glance	1
8	**Practical data**	Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (3 aspects are all fulfilled)	4
		Complete the table according to the results of observations, accompanied by pictures, or accompanied by additional data (information) on the results of the practicum (2 aspects are well fulfilled)	3

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		Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (1 aspect is well fulfilled)	2
		Complete the table according to the results of observations, accompanied by pictures, and accompanied by additional data (information) on the results of the practicum (no aspect is fulfilled properly)	1
Closing			
9	**Cleanliness of tools that have been used**	All tools that have been used are cleaned properly and returned	4
		Clean all tools that have been used but are not completely clean and return them	3
		Only clean half of used tools and return them	2
		Only clean one or two tools and don't restore all tools	1
10	**Practice table cleaning**	Clean the table until it's really clean	4
		Cleaning the table but still leaving dirt or trash	3
		Only clean part of the side of the table	2
		The table is still dirty, but throw away the dirt or trash	1

PRACTICUM REPORT RUBRIC ASSESSMENT

No	Aspek	Score			
		1	2	3	4
1	Write the title and purpose of the practicum correctly				
2	Formulate the problem				
3	Write the theoretical basis clearly and concisely				
4	Arrange tools, materials and work steps appropriately				
5	Presenting data systematically and communicatively				
6	Analyze data and discussion comprehensively				
7	Drawing conclusions				
8	Writing bibliography				
9	Attachments (evidence of activities, documentation, interim reports)				
10	Timely collection				

Example of Mid Term Exam

Plant Anatomy

1. Pay attention to the characteristics of the tissue in the following plants.
   (1) Cells have very small vacuoles.
   (2) The arrangement of cells is very tight.
   (3) Has space between cells.
   (4) The nucleus of the cell (nucleus) is large.
   (5) Cells contain little protoplasm.

The characteristics of meristem tissue are indicated by the number...

A. 1, 2, dan 4
B. 1, 3, dan 4
C. 2, 3, dan 4
D. D. 2, 4, dan 5
E. E. 3, 4, dan 5

Answer: A

2. Plant tissue whose cells actively divide by mitosis, namely...

A. Sclerenchyma
B. Sklereid
C. Secretary

D. meristem
E. Epidermis

Answer: D

3. Higher plant tissues whose cell walls are irregularly thickened are...
   A. Collenchyma
   B. parenchyma
   C. Chlorenchyma
   D. Sclerenchyma
   E. Sklereid

Answer: A

4. Root branches (lateral roots) are formed from the division of cells ...
   A. Epidermis
   B. cambium
   C. Pericycle
   D. Endoderm
   E. Cortex

Answer: C

5. Monocot plants that have a cambium on their stems are…
   A. Zea mays
   B. Dracaena sp.
   C. Bambusa sp.
   D. Musa paradisiaca
   E. Saccharum officinarum

Answer: B

Example of Final Exam
Plant Morphology (Real Plants)

1. Specimen 1
   a. Species name
   b. Phytochemical content
2. Specimen 2
   a. Flowering type
   b. Root type
   c. Leave type
3. Write down the name of the species used for lotek/gado-gado!
4. Write down 5 species (latin) of plants (trees) that grow and live in the MIPA Education Study Program environment!
5. Mention 5 species (latin) of plants (trees) that you meet in UNS, that belong to monoecious groups!