

Bachelor of Biology EducationEmail: biologi.fmipa@um.ac.idWebsite: <http://biologi.fmipa.um.ac.id/>**MODULE HANDBOOK**

Module designation	Plant Structure and Development 1
Module level, if applicable	Undergraduate
Code, if applicable	PBIOUM6110
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	Even Semester
Person responsible for the module	Dr. Sulisetijono, M.Si
Lecturer	Dr. Sulisetijono, M.Si Umi Fitriyati, S.Pd., M.Pd. Andik Wijayanto, S.Si., M.Si. Rahmi Masita, S.Si., M.Sc. Sunarmi, S.Pd., M.Pd. Dr. Murni Saptasari, M.Si.
Language	Bahasa Indonesia
Relation to curriculum	Undergraduate degree program, compulsory, 2nd semester.
Type of teaching, contact hours	Undergraduate degree program: cooperative learning, presentation, laboratory work, 2 x 50 = 100 minutes and 1 x 170 minutes
Workload	1. Lectures: 2 x 50 = 100 minutes (1.67 hours) per week. 2. Exercises and Assignments: 2 x 60 = 120 minutes (2 hours) per week. 3. Laboratory work: 1 x 170 minutes (2.83 hours) per week. 4. Private study: 2 x 60 = 120 minutes (2 hours) per week.
Credit points	3 credit points (~5 ECTS-eq)
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to be eligible for the final examination.
Recommended prerequisites	PBIOUM6101 General Biology PBIOUM6106 Laboratory Technique
Module objectives/intended learning outcomes	Students are able to: (LO2) Master basic biological theoretical concepts in an integrated manner, logically, critically, systematically and innovatively through the science and technology approach to analyze various problems in the field of biology

Course Learning Outcomes	1. Analyzing the life forms of flowering plants carefully through literature studies and observations of nearby plant specimens. 2. Analyzing the function of flowering plant organs based on cell and tissue structures carefully through literature studies and observations of surrounding plant specimens. 3. Applying knowledge of the morphological structure and anatomy of vegetative organs of surrounding flowering plants carefully through the task of describing to relate functions and roles in life	
Content	This course covers the following main topics: • Introduction: Terms of internal morphology and outer morphology • Talus and corm plant bodies. • Problems and coverage of studying the form, arrangement, and function of plant organs. • The formation and development of the organs concerned. • Terminology of vascular plant organ coverage. • Forms of life based on the length of life, based on adaptation to the environment, and based on how to survive against less profitable machines. • The composition of the plant body, including parts of the plant body, internal organization. • The development of the plant body including the origin of the plant body, primary growth, and secondary growth. • Nutrient tools, including roots, stems, leaves. • Reproductive organs including flower structure, development of flowers. • Organogenesis, morphogenesis, sporogenesis, embryogenesis, pollination, germination, dispersal, collection and identification.	
Learning Activity	Week 1	• Scope of plants: Life forms and basic aspects of growth (primary and secondary) and development of plants, especially seed plants. • Difference between the tissue and tissue system. • Assignments: 1) germination project; 2) Studying a plant starting from the morphological and anatomical structure of the vegetative organs and their use in everyday life
	Week 2	Plant cell (cell wall, protoplasmic and non-protoplasmic components; cell division)
	Week 3	• Simple and Complex Tissue. Meristematic and permanent tissue (meristem, ground tissue (parenchyma). • Practicum 1: Cell 1: Cell wall, the difference between dead cells and living cells; protoplasmic components
	Week 4	• The tissue (mechanical tissue, protective tissue). Identify the parts that make up the tissue. • Practicum 2: Cell 2: non-protoplasmic components.

	Week 5	• Vascular tissue; types of vascular bundle; stele concept. • Practicum 3: Simple tissue (ground and mechanical tissue): parenchyma, collenchyma & sclerenchyma
	Week 6	• Root 1: Introduction; root morphology structure): Root properties and functions; Arrangement and shape of roots; Root type (main, branch, adventitious); Root system; Specialized root. • Practicum 4: complex tissue (vascular tissue)
	Week 7	• Root 2: development, primary anatomical structure of monocot & dicot roots); Root anomaly. • Practicum 5: various types of epidermal derivatives in plant
	Week 8	MIDTERM EXAMINATION
	Week 9	• Stem: morphology structure of the stem; specialized stem; kind of stem. • Practicum 6: root morphology
	Week 10	• Tree Architecture. • Practicum 7: root anatomy
	Week 11	• Stem: stem development; monocot & dicot stem anatomy structure. • Practicum 8: stem morphology
	Week 12	• Leaf morphology; simple leaf & compound leaf. • Practicum 8: anatomy of stem
	Week 13	• Leaf arrangements; Leaf anatomy. • Practicum 9: Leaf morphology
	Week 14	• Ecological anatomy of leaves. • Practicum 10: Leaf Anatomy
	Week 15	• Roots, stems, leaves. • Project completion
	Week 16	FINAL EXAMINATION
Study and examination requirements and forms of examination	Midterm examination (S1) = 15% Activities: attendance, presentation-question-and-answer (S2) = 15% Practical report (S3) = 15% Performance test (S4) = 10% Project task (S5) = 25% Final examination (S6) = 20%	
Media employed	LCD, Whiteboard, Sipejar, Microscope, Camera Microscope	
Reading list	1. Beentje, Henk. 2010. <i>The Kew Plant Glossary: an illustrated dictionary of plant terms</i>: Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK. 2. Bell, A. D. 1991. <i>An Illustrated Guide to Flowering Plant Morphology</i>. New York: Oxford UP. 3. Bhojwani, SS and Bhatnagar, SP. 1981. <i>The embryology of Angiosperms</i>. New Delhi: Vikas Publishing House PVT LTD.	

	4. Bidlack, James E..2011. <i>Stern's Introductory Plant Biology</i>, Twelfth Edition. New York: The McGraw-Hill Companies 5. Bowes, Bryan G., Mauseth, James D.2008. <i>Plant Structure: A Colour Guide. Second Edition</i>. London: Manson Publishing Ltd. 6. Crang, Richard; Lyons-Sobaski, Sheila & Wise, Robert. 2018. <i>Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants</i>. Springer Nature Switzerland AG 7. Cutler, D. F., Botha, T., Stevenson, D. W. 2008. <i>Plant anatomy: an applied approach</i>. Oxford: Blackwell Publishing. (paperback) 312 pp. 8. Evert, Ray Franklin. 2006. <i>Esau's Plant anatomy: meristems, cells, and tissues of the plant body: their structure, function, and development</i>. John Wiley & Sons, Inc., Hoboken, New Jersey. Published simultaneously in Canada. 9. Hajiboland, Roghieh, Farhangi, Fereshteh & Aliasgharpour, Mahboobeh.2012. Morphological and anatomical modifications in leaf, stem and roots of four plant species under boron deficiency conditions. <i>Anales de Biología</i> 34: 15-29, 2012. DOI: http://dx.doi.org/10.6018/analesbio.0.34.4 10. Halle, F and Oldeman, RAA. 1975. An Essay on the Architecture and Dynamics of Growth of Tropical Trees (Trans). Kuala lumpur: Penerbit University. 11. Kirchoff, B.K. 2011. Atlas of Stem Anatomy in Herbs. Shrubs and Trees (Review). <i>Plant Science Bulletin</i>. 57(3): 114-118. 12. Noguchi, Tetsuko; Kawano, Shigeyuki; Tsukaya, Hirokazu; Matsunaga; Sachihiro; Sakai, Atsushi; Karahara, Ichirou; Hayashi, Yasuko. 2014. <i>Atlas of Plant Cell Structure</i>. Springer Tokyo Heidelberg New York Dordrecht London. 13. Nugroho, Hartanto, Purnomo & Sumardi, I. Struktur & Perkembangan Tumbuhan. 2018. Bogor: Penebar Swadaya. 14. Shipunov, Alexey. 2017. <i>Introduction to Botany</i>. USA: Minot State University (North Dakota). 15. Sulisetijono, Sari, Murni Sapta & Sunarmi. 2020. <i>Bahan Ajar: Struktur & Perkembangan I</i>. Malang: Jurusan Biologi FMIPA UM 16. Sunarmi, Sulasmi, E.S., Moertolo, A. 2015. <i>Bahan Serahan Morfologi Tumbuhan</i>. Malang: FMIPA UM. 17. Sulasmi, E.S., Sunarmi & Moertolo, A.. 2015. <i>Akar</i>. Malang: FMIPA UM.
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	18. Sulasmi, E.S., Sunarmi & Moertolo, A. 2015. <i>Daun dan Alat Tambahan</i>. Malang: FMIPA UM. 19. Sulasmi, E.S., Sunarmi & Moertolo, A. 2018. <i>Petunjuk Pengamatan Morfologi Tumbuhan</i>. Malang: FMIPA UM. 20. Tjitrosopoemo, Gembong. 2020. <i>Morfologi Tumbuhan</i>. Yogyakarta: Gadjah Mada University Press.
Date of Class Amendment Made	January 2022