

	Universitas Negeri Surabaya Fakultas Matematika dan Ilmu Pengetahuan Alam Program Studi S1 Pendidikan Sains						Kode Dokumen																																																																																																				
RENCANA PEMBELAJARAN SEMESTER																																																																																																											
MATA KULIAH (MK)	KODE	Rumpun MK	BOBOT (sks)			SEMESTER	Tgl Penyusunan																																																																																																				
Anatomi dan Fisiologi Tumbuhan	8420103162		T=2	P=1	ECTS=4.77	0	27 Desember 2025																																																																																																				
OTORISASI	Pengembang RPS		Koordinator RMK			Koordinator Program Studi																																																																																																					
Model Pembelajaran	Project Based Learning																																																																																																										
Capaian Pembelajaran (CP)	CPL-PRODI yang dibebankan pada MK																																																																																																										
	CPL-11	Design and conduct research about learning of integrated science, and acquire, analyze, and interpret the research data																																																																																																									
	CPL-13	Demonstrate knowledge of integrated science (physics, chemistry, and biology)																																																																																																									
	Capaian Pembelajaran Mata Kuliah (CPMK)																																																																																																										
	CPMK - 1	Explaining phenomena and processes in plant anatomy and physiology using biology and chemistry concepts.																																																																																																									
	CPMK - 2	Apply principles/laws/theories to various phenomena in plant anatomy and physiology.																																																																																																									
	CPMK - 3	Menerapkan konsep substantif (prinsip/hukum/teori) dalam bidang anatomi dan fisiologi tumbuhan dalam menganalisis kasus yang relevan.																																																																																																									
	CPMK - 4	Design and conduct research about plant anatomy and physiology.																																																																																																									
	Matrik CPL - CPMK																																																																																																										
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th style="width: 10%;">CPMK</th> <th style="width: 10%;">CPL-11</th> <th style="width: 10%;">CPL-13</th> </tr> <tr><td>CPMK-1</td><td></td><td></td></tr> <tr><td>CPMK-2</td><td></td><td></td></tr> <tr><td>CPMK-3</td><td></td><td></td></tr> <tr><td>CPMK-4</td><td></td><td></td></tr> </table>							CPMK	CPL-11	CPL-13	CPMK-1			CPMK-2			CPMK-3			CPMK-4																																																																																							
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Matrik CPMK pada Kemampuan akhir tiap tahapan belajar (Sub-CPMK)																																																																																																											
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Deskripsi Singkat MK	Kajian tentang struktur, fungsi, dan perkembangan organ tumbuhan tinggi ditinjau dari sifat morfologi dan anatominya. Kajian meliputi struktur dan fungsi dalam dan perkembangan sel tumbuhan, perbandingan dengan sel hewan, perkembangan meristem sampai jaringan dewasa, bermacam-macam jaringan (Struktur, fungsi, dandan perkembangannya), Struktur, fungsi, dan perkembangan organ pada tumbuhan vaskuler meliputi struktur perkembangan batang, akar, daun, buah, dan biji serta anomali yang terjadi pada masing-masing organ.																																																																																																										
Pustaka	Utama :																																																																																																										
	1. Beck, Charles B. 2010. An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2 Edition Book. New York: Cambridge University Press. 2. Adam, Jennifer W. Mac, 2008. Structure and Function of Plants. New Delhi: Willey Blackwell. 3. Taiz, L. and Zeiger E. 2010. Plant Physiology. Fifth Edition. Sinauer Associates. California: Sunderland. 4. Tjitrosoepomo, Gembong. 2013. Morfologi Tumbuhan. Yogyakarta: Gadjah Mada University Press.																																																																																																										

		Pendukung :					
Dosen Pengampu		Dr. Rinie Pratiwi Puspitawati, M.Si. Dr. Dyah Astriani, S.Pd., M.Pd. Enny Susiyawati, S.Si., M.Sc., M.Pd., Ph.D. Dhita Ayu Permata Sari, S.Pd., M.Pd. Aris Rudi Purnomo, S.Si., M.Pd., M.Sc. Wahyu Budi Sabtiawan, S.Si., M.Pd., M.Sc.					
Mg Ke-	Kemampuan akhir tiap tahapan belajar (Sub-CPMK)	Penilaian		Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu]		Materi Pembelajaran [Pustaka]	Bobot Penilaian (%)
		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Menjelaskan konsep dasar tentang anatomi dan fisiologi akar.	1.Identifiying anatomical structure of a root. 2.Explaining the function of a root. 3.Describing biological processess in a root.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipasif, Tes	Presentation, discussion, and observation 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Root Anatomy Pustaka: Beck, Charles B. 2010. <i>An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2 Edition Book.</i> New York: Cambridge University Press. Materi: Root Anatomy Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants.</i> New Delhi: Willey Blackwell. Materi: Physiology of Root Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition.</i> Sinauer Associates. California: Sunderland. Materi: Root Morphology Pustaka: Tjitrosoepomo, Gembong. 2013. <i>Morfologi Tumbuhan.</i> Yogyakarta: Gadjah Mada University Press.	5%

2	Explaining basic concepts about anatomy and physiology of stem.	1. Identifying anatomical structure of a stem. 2. Explaining the function of a stem. 3. Describing biological processes in a stem.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif, Tes	Presentation, discussion, and observation 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Stem Anatomy Pustaka: Beck, Charles B. 2010. <i>An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2 Edition Book.</i> New York: Cambridge University Press. Materi: Stem Anatomy Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants.</i> New Delhi: Willey Blackwell. Materi: Stem Physiology Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition.</i> Sinauer Associates. California: Sunderland. Materi: Stem Morphology Pustaka: Tjitrosoepomo, Gembong. 2013. <i>Morfologi Tumbuhan.</i> Yogyakarta: Gadjah Mada University Press.	5%
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3	Explaining basic concepts about anatomy and physiology of leaf.	1. Identifying anatomical structure of a leaf. 2. Explaining the function of a leaf. 3. Describing biological processes in a leaf.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif, Tes	Presentation, discussion, and observation 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Leaf Anatomy Pustaka: Beck, Charles B. 2010. <i>An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2 Edition Book.</i> New York: Cambridge University Press. Materi: Leaf Anatomy Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants.</i> New Delhi: Willey Blackwell. Materi: Leaf Physiology Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition.</i> Sinauer Associates. California: Sunderland. Materi: Leaf Morphology Pustaka: Tjitrosoepomo, Gembong. 2013. <i>Morfologi Tumbuhan.</i> Yogyakarta: Gadjah Mada University Press.	5%
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4	Describing phenomena of water transportation in plants.	1.Explaining phenomena of diffusion and osmosis in plants. 2.Describing the process of plant water transportation. 3.Explaining the process of plant translocation.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif, Penilaian Praktikum, Tes	Presentation, discussion, and observation 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Diffusion and osmosis in plants, Plant water transportation, Plant translocation. Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants</i> . New Delhi: Willey Blackwell. Materi: Diffusion and osmosis in plants, Plant water transportation, Plant translocation. Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition</i> . Sinauer Associates. California: Sunderland.	10%
5	Explaining photosynthesis processess using biology and chemistry concepts.	1.Explaining the processess of photosynthesis. 2.Describing chemical reactions during the process of photosynthesis. 3.Menjelaskan peralihan struktur anatomi akar ke batang	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif, Penilaian Praktikum, Tes	Presentation, discussion, and observation 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Photosynthesis and Chemical reactions in photosynthesis. Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants</i> . New Delhi: Willey Blackwell. Materi: Photosynthesis and Chemical reactions in photosynthesis. Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition</i> . Sinauer Associates. California: Sunderland.	10%

6	Interpreting diagrams of respiration processes in plants.	1.Describing the stages of plant respiration. 2.Explaining a diagram of the process of plant respiration. 3.Describing chemical reactions during the process of plant respiration.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif	Presentation, discussion, and observation 2 X 50	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 x 60	Materi: Plant respiration and Chemical reactions in plant respiration. Pustaka: <i>Adam, Jennifer W. Mac, 2008. Structure and Function of Plants. New Delhi: Willey Blackwell.</i> Materi: Plant respiration and Chemical reactions in plant respiration. Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition. Sinauer Associates. California: Sunderland.</i>	5%
7	Explaining phenomena in plants in relation to plant hormones.	1.Describing the phenomena of tip bending to the light. 2.Explaining chemical reaction in relation to auxin.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Aktifitas Partisipatif, Penilaian Praktikum, Tes	Presentation, discussion, and observation. 2 X 50 3 X 60	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 X 60	Materi: Plant hormones Pustaka: <i>Adam, Jennifer W. Mac, 2008. Structure and Function of Plants. New Delhi: Willey Blackwell.</i> Materi: Plant hormones Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition. Sinauer Associates. California: Sunderland.</i>	10%

8	-	1.Explaining basic concepts about anatomy and physiology of root. 2.Explaining basic concepts about anatomy and physiology of stem. 3.Explaining basic concepts about anatomy and physiology of leaf. 4.Describing phenomena of water transportation in plants. 5.Explaining photosynthesis processess using biology and chemistry concepts. 6.Interpreting diagrams of respiration processess in plants. 7.Explaining phenomena in plants in relation to plant hormones.	Kriteria: Quantitative (Scoring Guide) Bentuk Penilaian : Tes	Test (Midterm Test) 2 X 50	Materi: Plant Anatomy Pustaka: Beck, Charles B. 2010. <i>An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2 Edition Book.</i> New York: Cambridge University Press. Materi: Plant Anatomy and Function Pustaka: Adam, Jennifer W. Mac, 2008. <i>Structure and Function of Plants.</i> New Delhi: Willey Blackwell. Materi: Plant Physiology Pustaka: Taiz, L. and Zeiger E. 2010. <i>Plant Physiology. Fifth Edition.</i> Sinauer Associates. California: Sunderland. Materi: Plant Morphology Pustaka: Tjitrosoepomo, Gembong. 2013. <i>Morfologi Tumbuhan.</i> Yogyakarta: Gadjah Mada University Press.	0%
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9	Designing a research about leaf anatomy and physiology.	Providing a research design about leaf anatomy and physiology.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif	Discussion 2 X 50	Flipped Learning using Virtual Learning Unesa, Vinesa or Google Classroom	Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	10%
10	Conducting a research about leaf anatomy and physiology.	Conducting a research about leaf anatomy and physiology.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif, Praktik / Unjuk Kerja	Research and discussion 2 X 50 3 X 60		Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	5%

11	-	Conducting a research about leaf anatomy and physiology.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipatif, Praktik / Unjuk Kerja	Research and discussion 2 X 50 3 X 60		Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	5%
12	Creating a research article about leaf anatomy and physiology.	Providing a research article about leaf anatomy and physiology.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipatif, Penilaian Hasil Project / Penilaian Produk	Research and discussion 3 X 50	Online Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 X 60	Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	10%

13	-	Providing a research article about leaf anatomy and physiology.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif, Penilaian Hasil Project / Penilaian Produk	Research and discussion 3 X 50	Online Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 X 60	Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	5%
14	Communicating research findings about leaf anatomy and physiology orally.	Communicating research findings about leaf anatomy and physiology orally.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif, Penilaian Hasil Project / Penilaian Produk, Praktik / Unjuk Kerja	Discussion 3 X 50	Online Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 X 60	Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	10%

15	-	Communicating research findings about leaf anatomy and physiology orally.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif, Praktik / Unjuk Kerja	Discussion 3 X 50	Online Learning using Virtual Learning Unesa, Vinesa or Google Classroom 3 X 60	Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	5%
16	-	1.Designing a research about leaf anatomy and physiology. 2.Conducting a research about leaf anatomy and physiology. 3.Creating a research article about leaf anatomy and physiology. 4. Communicating research findings about leaf anatomy and physiology orally.	Kriteria: Qualitative (Rubric) Bentuk Penilaian : Aktifitas Partisipasif, Penilaian Hasil Project / Penilaian Produk, Praktik / Unjuk Kerja	Final Test 3 X 50		Materi: Effect of temperature on leaf anatomy and physiology Pustaka: <i>Djanaguiraman, M., Prasad, P. V., Boyle, D., & Schapaugh, W. (2011). High-temperature stress and soybean leaves: leaf anatomy and photosynthesis. Crop Science, 51(5), 2125-2131</i> Materi: Effects of pollution on leaf structure Pustaka: <i>Gostin, I. N. (2009). Air pollution effects on the leaf structure of some Fabaceae species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 37(2), 57-63.</i>	0%

Rekap Persentase Evaluasi : Project Based Learning

No	Evaluasi	Persentase
1.	Aktifitas Partisipasif	50.82%

2.	Penilaian Hasil Project / Penilaian Produk	10.83%
3.	Penilaian Praktikum	9.99%
4.	Praktik / Unjuk Kerja	10.83%
5.	Tes	17.49%
		99.96%

Catatan

1. **Capaian Pembelajaran Lulusan Prodi (CPL - Prodi)** adalah kemampuan yang dimiliki oleh setiap lulusan prodi yang merupakan internalisasi dari sikap, penguasaan pengetahuan dan ketrampilan sesuai dengan jenjang prodinya yang diperoleh melalui proses pembelajaran.
2. **CPL yang dibebankan pada mata kuliah** adalah beberapa capaian pembelajaran lulusan program studi (CPL-Prodi) yang digunakan untuk pembentukan/pengembangan sebuah mata kuliah yang terdiri dari aspek sikap, ketrampilan umum, ketrampilan khusus dan pengetahuan.
3. **CP Mata kuliah (CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPL yang dibebankan pada mata kuliah, dan bersifat spesifik terhadap bahan kajian atau materi pembelajaran mata kuliah tersebut.
4. **Sub-CPMK Mata kuliah (Sub-CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPMK yang dapat diukur atau diamati dan merupakan kemampuan akhir yang direncanakan pada tiap tahap pembelajaran, dan bersifat spesifik terhadap materi pembelajaran mata kuliah tersebut.
5. **Indikator penilaian** kemampuan dalam proses maupun hasil belajar mahasiswa adalah pernyataan spesifik dan terukur yang mengidentifikasi kemampuan atau kinerja hasil belajar mahasiswa yang disertai bukti-bukti.
6. **Kreteria Penilaian** adalah patokan yang digunakan sebagai ukuran atau tolok ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikator yang telah ditetapkan. Kreteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kreteria dapat berupa kuantitatif ataupun kualitatif.
7. **Bentuk penilaian:** tes dan non-tes.
8. **Bentuk pembelajaran:** Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian Kepada Masyarakat dan/atau bentuk pembelajaran lain yang setara.
9. **Metode Pembelajaran:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, dan metode lainnya yg setara.
10. **Materi Pembelajaran** adalah rincian atau uraian dari bahan kajian yg dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
11. **Bobot penilaian** adalah prosentasi penilaian terhadap setiap pencapaian sub-CPMK yang besarnya proposional dengan tingkat kesulitan pencapaian sub-CPMK tsb., dan totalnya 100%.
12. TM=Tatap Muka, PT=Penugasan terstruktur, BM=Belajar mandiri.