

Universitas Negeri Surabaya Faculty of Engineering, Mechanical Engineering Undergraduate Study Program

Document Code

SEMESTER LEARNING PLAN

Courses			CODE			Cou	rse Fa	amily		С	redi	t Wei	ght	SEME	STER	Con Date	npilation e
Mechanics ar Materials 2	nd Strength of		212010211	4		Com Prog	ipulso Jram S	ory Stud Subject	ly s	Т	=2	P=0	ECTS=3.1	3	3	July	16, 2024
AUTHORIZAT	TION		SP Develo	per		-			Cou	urse C	Clust	er Co	oordinator	Study	Program	n Coo	rdinator
			Novi Sukma	a Dras	stiawati				Nov	/i Sukr	ma D	Drastir	awati	Ir. Priy	/o Heru A	diwibo	owo, S.T.,
Learning model	Case Studies																
Program	PLO study prog	gram t	hat is char	ged to	o the cou	rse											
Outcomes	Program Object	tives (is (PO)														
(PLO)	PO - 1	CO1/0 particu to rela elicit p	CO1/CPMK1 a. Ability to Identify specific facts about mathematics, science, and engineering that are needed for a particular situation (What knowledge is needed) b. Able to change real world situations into models that are appropriate o related courses c. Able to demonstrate appropriate use of specific facts of mathematics, science, and engineering to elicit performance behavior given specific input.														
	PO - 2	Able to data a experi	o obtain data and results w iments.	ι abou /ith ap	it appropria propriate f	ate vai theore	riables tical r	s in the nodels.	e field o . c. Be	of Mee e able	chan to e	ical E xplai	Engineering n observed	b. Able t differenc	o compa es betwe	re exp een me	erimental odels and
	PO - 3	Able to Able to	to formulate problems and identify main problems / variables b. Ability to recognize multiple necessary solutions. c. to analyze alternative solutions to engineering problems d. Able to provide solutions to technical problems														
	PLO-PO Matrix																
			P.O														
			PO-1														
			PO-2														
			PO-3														
												_					
	PO Matrix at th	e end	of each lea	rning	stage (S	ub-PC))										
				<u> </u>													
			P.0			1.	-		-	<u> </u>	wee	K				45	10
			N 1	1	2 3	4	5	6	1	8	9	10	11 1	2 13	14	15	16
		PC)-2		<u>├</u>	<u> </u>				_				_	+		
		PC)-3			-				_				_			
			5-5		<u> </u>	<u> </u>											
Short Course Description	This course prov statically indeterr and diagram met	ides an ninate 1 hods. M	n understandi theories, tens Aohr's circle.	ng of sile, c	the proper ompressive	rties of e, she	f supp ar, be	oorts, a ending a	inalysi: and to	s of n rsion	orma stres	al foro sses,	ces, momer thermal, He	its of trus oke's lav	ses in co v, elastic	ertain line e	static and quations,
References	Main :																
	 Bear, F.P. dan Johnston, E.R. 1987. Statika. (Mekanika untuk Insinyur), Jakarta: Erlangga. Heinz Frick. 1991. Mekanika Teknik 1 (Statika dan Kegunaanya). Yogyakarta: Kanisius. Timoshenko, S. dan Young, D.H. 1990. Mekanika Teknik. Jakarta: Erlangga. Hibbeler, R.C. Engineering Mechanics : Statics, 13th edition. Prentice Hall Rusell C. Hibbeler. Mechanics of Materials, 8th Edition. Prentice Hall 																
	Supporters:																
	1. [1] R u s Mechani	ssel C c s of N	. H i bbeler /a t eri a ls, 8	, Eng 3th eo	ineeringl dition, P	Mecha 'rentic	unics: eНa	: Stati all	cs,1	13th e	editic	on, P	rentice Ha	ll [2] R	u ssel C	. Hi	b b eler ,
Supporting lecturer	Iskandar, S.T., M Mochamad Arif Ir Novi Sukma Dras	I.T. faʻi, S.F stiawati	Pd., M.T. . S.T., M.Fng	1.													

Week-	Final abilities of each learning stage	Eva	aluation	He Lear Studer [Es	elp Learning, ning methods, nt Assignments, stimated time]	Learning materials	Assessment Weight (%)
	(Sub-PO)	Indicator	Criteria & Form	Offline(offline)	Online (online)	[References]	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	 Students are able to analyze the properties of supports and normal forces Describe and analyze the results Describe the stress due to combined loads 	a. Explain the meaning of stress due to combined loads b. Calculate stress due to combined loads c. Explain the results of calculating combined stresses	Criteria: 1.a. Presence 2.b. Activeness in questions and answers, seriousness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Portfolio Assessment	Lecture discussion questions and answers exercises and assignments Lecture Case study, Discussion in groups Task-1: Calculating stress due to combined loads and calculating combined stress in beams 2x50 minutes 2 X 50		Material: Calculating stress due to combined loads and calculating combined stress in beams. References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga.	1%
2	Describing 2D stress transformations: analytical and graphical (Mohr) Describing Plane stress-plane strain	1.a. Explaining 2D stress transformations: analytical and graphical (Mohr) 1.c. Calculating 2D stress transformations: analytical and graphical (Mohr) 1.a. Explaining 2D stress transformations: analytical and graphical (Mohr) 1.a. Explaining Plane stress- plane stress- plane stress- plane stress- plane stress- plane strain 1.c. Calculating Plane stress-plane strain	Criteria: 1.a. Presence 2.b. Activeness in questions and answers, seriousness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Portfolio Assessment	Lectures, discussions, questions and answers, exercises and assignments , Lectures , case studies, discussions in groups 2 X 50		Material: Calculating 2D stress transformations analytically and using the Mohr's circle method Calculating plane stress and plain strain 2 (2x50) minutes References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Calculating 2D stress transformations analytically and using the Mohr's circle method Calculating plane stress and plain strain 2 (2x50) minutes References: Hibbeler, RC Engineering Mechanics : Statics, 13th edition. Prentice Hall	1%

3	Describing 2D stress transformations: analytical and graphical (Mohr) Describing Plane stress-plane strain	1.a. Explaining 2D stress transformations: analytical and graphical (Mohr) 1.c. Calculating 2D stress transformations: analytical and graphical (Mohr) 1.a. Explaining 2D stress transformations: analytical and graphical (Mohr) 1.a. Explaining Plane stress- plane stress- plane stress- plane stress- plane strain 1.c. Calculating Plane stress-plane strain	Criteria: 1.a. Presence 2.b. Activeness in questions and answers, seriousness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Portfolio Assessment	Lectures, discussions, questions and answers, exercises and assignments , Lectures , case studies, discussions in groups 2 X 50	Material: Calculating 2D stress transformations analytically and using the Mohr's circle method Calculating plane stress and plain strain 2 (2x50) minutes References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Calculating 2D stress transformations analytically and using the Mohr's circle method Calculating plane stress and plain strain 2 (2x50) minutes References: Hibbeler, RC Engineering Mechanics : Statics, 13th edition. Prentice Hall	1%
4	Analyzing extreme stresses	 Calculate tensile and compressive stress A.a. Describe 3D stress transformation: analytical and graphical 4.b. Describe the State of stress 	Criteria: 1.a. Presence 2.b. Activeness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Tests	Lectures, discussions, questions and answers, exercises and assignments. Participation, Written test, (Quiz-3) 4 X 50	Material: Analyzing the results of extreme stress calculations References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Analyzing the results of extreme stress calculations Reference: Russell C. Hibbeler. Mechanics of Materials, 8th Edition. Prentice Hall Material: Analyzing the results of extreme stress calculations References: Timoshenko, S. and Young, DH 1990. Engineering Mechanics. Jakarta: Erlangga.	5%

5	Analyzing extreme stresses	 1.Calculate tensile and compressive stress 2.4.a. Describe 3D stress transformation: analytical and graphical 4.b. Describe the State of stress 	Criteria: 1.a. Presence 2.b. Activeness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Tests	Lectures, discussions, questions and answers, exercises and assignments. Participation, Written test, (Quiz-3) 4 X 50	Material: Analyzing the results of extreme stress calculations References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Analyzing the results of extreme stress calculations Reference: Russell C. Hibbeler. Mechanics of Materials, 8th Edition. Prentice Hall Material: Analyzing the results of extreme stress calculations References: Timoshenko, S. and Young, DH 1990. Engineering	4%
					1990. Engineering Mechanics. Jakarta: Erlangga.	

6	Describe extreme stresses Perform calculations of extreme stresses	2.a. Categorize extreme stresses (principal, max shear and von Mises) 2.a. Explaining extreme stresses (principal, max shear and von Mises) 2.C Calculating extreme stresses (principal, max shear and von Mises)	Criteria: 1.a. Presence 2.b. Activeness in attending lectures 3.c. Compliance with the answer key Forms of Assessment Participatory Activities, Portfolio Assessment, Practice / Performance	Lectures, discussions, questions and answers, exercises and assignments. 2 X 50		Material: Calculating principal stress, maximum shear stress, and stress calculation methods (Von Mises and Tresca) References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Calculating principal stress, and stress calculation methods (Von Mises and Tresca) References: <i>Russell C.</i> Hibbeler. Mechanics of Materials, 8th Edition. Prentice Hall Material: Calculating principal stress, and stress calculation methods (Von Mises and Tresca) References: Heinz Frick. 1991. Engineering Mechanics 1 (Statics and Its Uses). Yogyakarta: Kanisius.	2%
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7	Describe extreme stresses Perform calculations of extreme stresses	2.a. Categorize extreme stresses (principal, max shear and von Mises) 2.a. Explaining extreme stresses (principal, max shear and von Mises) 2.c Calculating extreme stresses (principal, max shear and von Mises)	Criteria: 1.a. Presence 2.b. Activeness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities, Practice/Performance	Lectures, discussions, questions and answers, exercises and assignments. 2 X 50	Material: Calculating principal stress, maximum shear stress, and stress calculation methods (Von Mises and Tresca) References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: Calculating principal stress, and stress calculation methods (Von Mises and Tresca) References: Russell C. Hibbeler. Material: Calculating principal stress, and stress calculation methods (Von Mises and Tresca) References: Russell C. Hibbeler. Material: Calculating principal stress, and stress calculation. Prentice Hall Material: Calculating principal stress, and stress calculation. Prentice Hall Material: Calculating principal stress, and stress calculation. Prentice Hall Material: Calculating principal stress, and stress calculation Mises and Tresca) References: Heinz Frick. 1991. Engineering Mechanics 1 (Statics and Its Uses). Yogyakarta:	6%
8	Sub Summative Exam	Sub Summative Exam	Criteria: Compliance with the answer key Form of Assessment : Participatory Activities, Tests	Sub Summative Exam 2 X 50	Material: SUB SUMATIVE TEST Reference: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga. Material: SUB SUMATIVE TEST Reference: Hibbeler, RC Engineering Mechanics: Statics, 13th edition.	20%
9	1.Describing security figures - design implementation 2.4.a Explaining security figures - 4.b Design implementation 4.d Analyzing security figures - Design implementation	Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55	Criteria: 1.a. Presence 2.b. Activeness in attending lectures 3.c. Compliance with the answer key Form of Assessment : Participatory Activities	Lectures, discussions, questions and answers, exercises and assignments 4 X 50	Material: Analyzing safety figures in stress calculations Reference: Hibbeler, RC Engineering Mechanics: Statics, 13th edition. Prentice Hall	3%

10	 Describing deflection in beams Calculating deflection in beams La Explaining the deflection in a beam 2.b. Describing the deflection in a particular beam: Double integration, discontinuous, moment area Calculating the deflection in a particular beam: Double integration, discontinuous, moment area Explain the deflection on the shaft due to critical rotation Calculating the deflection on the shaft due to critical rotation Calculating the deflection on the shaft due to critical rotation 2.b. Calculating indeterminate beam deflection: Double integration, discontinuity, moment area 	Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55	Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Form of Assessment : Participatory Activities	Participation, Written test, (Quiz-6)	Material: calculating beam deflection References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga.	3%
11	 Describing deflection in beams Calculating deflection in beams 2.a. Explaining the deflection in a beam 2.b. Describing the deflection in a particular beam: Double integration, discontinuous, moment area 2.b. Calculating the deflection in a particular beam: Double integration, discontinuous, moment area 2.a. Explain the deflection on the shaft due to critical rotation 2.b. Calculating the deflection on the shaft due to critical rotation 2.b. Calculating the deflection on the shaft due to critical rotation 2.b. Calculating indeterminate beam deflection: Double integration, discontinuity, moment area 	Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55	Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Form of Assessment : Participatory Activities	Participation, Written test, (Quiz-6)	Material: calculating beam deflection References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga.	3%

12	 Able to explain buckling in columns (vertical beams). Explain the strain energy method for structural deflection analysis 2.2.a. Describe buckling in columns (vertical beams) 2.b. Calculate buckling in columns (vertical beams) 2.a. Can explain the strain energy method for structural deflection 2.b. Can calculate the strain energy method for structural deflection 2.b. Can explain Castigliano's method for structural deflection 2.b. Can calculate Castigliano's method for structural deflection 2.b. Can calculate Castigliano's method for structural deflection 	2.a. Describe buckling in columns (vertical beams) 2.b. Calculate buckling in columns (vertical beams) 2.a. Can explain the strain energy method for structural deflection 2.b. Can calculate the strain energy method for structural deflection 2. a.Can explain Castigliano's method for structural deflection 2.b.Can calculate Castigliano's method for structural deflection 3.b.Can calculate	Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Form of Assessment : Participatory Activities	Participation, Written test, (Quiz-6)	Material: Calculating buckling in columns (ertical beams) Calculating deflections in structures Calculating the amount of strain energy References: <i>Bear, FP and</i> <i>Johnston, ER</i> <i>1987. Statics.</i> (<i>Mechanics for</i> <i>Engineers</i>), <i>Jakarta:</i> <i>Erlangga.</i> Material: Calculating buckling in columns (ertical beams) Calculating deflection in structures Calculating the amount of strain energy Reference: <i>Hibbeler, RC</i> <i>Engineering</i> <i>Mechanics :</i> <i>Statics, 13th</i> <i>edition.</i> <i>Prentice Hall</i>	5%
13	 Able to explain buckling in columns (vertical beams). Explain the strain energy method for structural deflection analysis 2.a. Describe buckling in columns (vertical beams) 2.b. Calculate buckling in columns (vertical beams) 2.b. Calculate buckling in columns (vertical beams) 2.a. Can explain the strain energy method for structural deflection 2.b. Can calculate the strain energy method for structural deflection 2. a. Can explain Castigliano's method for structural deflection 2.b. Can calculate Castigliano's method for structural deflection 	2.a. Describe buckling in columns (vertical beams) 2.b. Calculate buckling in columns (vertical beams) 2.a. Can explain the strain energy method for structural deflection 2.b. Can calculate the strain energy method for structural deflection 2. a.Can explain Castigliano's method for structural deflection 2.b.Can calculate Castigliano's method for structural deflection 2.b.Can calculate Castigliano's method for	Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Form of Assessment : Participatory Activities	Participation, Written test, (Quiz-6)	Material: Calculating buckling in columns (ertical beams) Calculating deflections in structures Calculating the amount of strain energy References : <i>Bear, FP and Johnston, ER</i> <i>1987. Statics.</i> (Mechanics for <i>Engineers), Jakarta:</i> <i>Erlangga.</i> Material: Calculating buckling in columns (ertical beams) Calculating deflection in structures Calculating the amount of strain energy Reference : <i>Hibbeler, RC Engineering Mechanics :</i> <i>Statics, 13th</i> <i>edition.</i> <i>Prentice Hall</i>	5%
14	Analyzing problems resulting from combined stress calculations, stress transformation, extreme stresses, deflections in beams, buckling in vertical beam columns, and strain	4.C. Analyze and provide alternative solutions to engineering problems	Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Forms of Assessment :	Participation, Performance	Material: • Phase 1: Orientation to the problem The lecturer explains the learning objectives,	5%

	energy methods for structural deflection	Participatory Activities,		explains the
	analysis	Practice / Performance		required,
				motivates
				towards the
				problem that will be chosen •
				Phase 2:
				students to
				study Lecturer
				define and
				organize learning tasks
				related to the
				chosen in
				Matkul Mekban 2 Students
				Students make
				observations in the field
				through articles
				until they find
				the topic of the
				3: Guiding
				Group Investigation
				Lecturers
				students to
				obtain
				information to
				assist in solving
				selected
				case studies
				related to the mechanics and
				strength of
				course 2
				Students carry
				directions
				given by the lecturer •
				Phase 4:
				present the
				results of their work. The
				lecturer
				students in
				analyzing and
				them in the
				form of video work. Students
				collect their
				to the agreed
				time limit. • Phase 5:
				Analyze and
				evaluate the problem
				solving
				Lecturers
				assist students in the process
				TM reflection
				anu evaluation: 2 (2x50)
				minutes - Main 1-4 Grade
				criteria:
				Special: 90 to 100; Verv
				good: 76 to 89;
				75; Below
				average: 0 to
				References:
				Hıbbeler, RC Engineering
				Mechanics:
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				Statics, 13th
				edition.
				Prentice Hall
				Material: •
				Phase 1
				Orientation to
				the problem
				The lecturer
				explains the
				objectives
				explains the
				logistics
				required,
				motivates
				students
				towards the
				will be chosen •
				Phase 2:
				Organizes
				students to
				study Lecturer
				neips students
				organize
				learning tasks
				related to the
				problem
				chosen in
				2 Students
				Students make
				observations in
				the field
				through articles
				or real events
				until they find
				problem Phase
				3: Guiding
				Group
				Investigation
				Lecturers
				encourage
				students to
				appropriate
				information to
				assist in
				solving
				selected
				problems or
				related to the
				mechanics and
				strength of
				materials
				course 2
				Students carry
				directions
				given by the
				lecturer •
				Phase 4:
				Develop and
				present the
				lecturer
				facilitates
				students in
				analyzing and
				presenting it in
				the form of
				Students
				collect their
				work according
				to the agreed
				time limit. •
				Phase 5:
				Analyze and
				problem
				solving
				process. The
				lecturer helps
				students in the
				process. TM
				reflection and
				(2x50) minutes
				- Main 1-4
				Grade criteria:
				Special: 90 to
-	-	•		· ·

			100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 References: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga.
			Material: • Phase 1: Orientation to the problem The lecturer explains the learning objectives, explains the logistics required, motivates students
			towards the problem that will be chosen • Phase 2: Organizes students to study Lecturer helps students define and organize learning tasks related to the problem chosen in Matful Mokhon
			2 Students Students make observations in the field through articles or real events until they find the topic of the problem Phase 3: Guiding Group Investigation Lecturers encourage
			students to obtain appropriate information to assist in solving selected problems or case studies related to the mechanics and strength of materials course 2
			Students carry out the directions given by the lecturer • Phase 4: Develop and present the results of their work. The lecturer facilitates students in
			analyzing and presenting them in the form of video work. Students collect their work according to the agreed time limit. • Phase 5: Analyze and evaluate the

			problem solving process. Lecturers assist students in the process TM reflection and evaluation: 2 (2x50) minutes - Main 1-4 Grade criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 References: <i>Timoshenko, S.</i> <i>and Young, DH</i> <i>1990.</i> <i>Engineering</i> <i>Mechanics.</i> <i>Jakarta:</i> <i>Erlangga.</i>
			Material: • Phase 1: Orientation to the problem The lecturer explains the learning objectives, explains the logistics required, motivates students towards the problem that will be chosen • Phase 2: Organizes students to study Lecturer helps students define and organize learning tasks related to the problem
			chosen in Matkul Mekban 2 Students Students make observations in the field through articles or real events until they find the topic of the problem Phase 3: Guiding Group Investigation Lecturers encourage students to obtain appropriate information to assist in solving selected problems or case studies related to the machanics and
			mechanics and strength of materials course 2 Students carry out the directions given by the lecturer • Phase 4: Develop and present the results of their work. The lecturer facilitates

			analyzing and presenting them in the form of video work. Students collect their work according to the agreed time limit. • Phase 5: Analyze and evaluate the problem solving process. Lecturers assist students in the process TM reflection and evaluation: 2 (2x50) minutes - Main 1-4 Grade criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Reference: <i>Heinz Frick.</i> 1991. <i>Engineering</i> <i>Mechanics</i> 1 (<i>Statics and Its</i> <i>Uses</i>). Yogyakarta: Kanisius.
			Material: • Phase 1: Orientation to the problem The lecturer explains the learning objectives, explains the logistics required, motivates students towards the problem that will be chosen • Phase 2: Organizes students to study Lecturer helps students define and organize learning tasks related to the problem chosen in Matkul Mekban 2 Students Students make observations in the field through articles or real events until they find the topic of the problem Phase 3: Guiding Group Investigation Lecturers encourage students to obtain appropriate information to assist in solving selected problems or case studies related to the mechanics and strength of

1	1		l	1	1	materials	1
						course 2	
						Students carry	
						out the directions	
						given by the	
						lecturer •	
						Phase 4:	
						present the	
						results of their	
						work. The	
						facilitates	
						students in	
						analyzing and	
						presenting them in the	
						form of video	
						work. Students	
						collect their	
						to the agreed	
						time limit. •	
						Phase 5: Analyze and	
						evaluate the	
						problem	
						solving	
						Lecturers	
						assist students	
						In the process	
						and evaluation:	
						2 (2x50)	
						minutes - Main	
						criteria:	
						Special: 90 to	
						100; Very	
						good: 76 to 89; Average: 56 to	
						75; Below	
						average: 0 to	
						55 References:	
						[1] R u ssel C .	
						H i bbeler ,	
						Engineering Mochanic s: St	
						a ti cs . 13th	
						edition, P	
						rentice Hall [2]	
						ibb eler .	
						Mechanic s of	
						Materials,	
15	Analyzing problems	4.C. Analyze and provide alternative	Criteria:	Participation,		Material: Rientice H all	5%
	combined stress	solutions to	90 to 100; Very good:	Periormance		Orientation to	
	calculations, stress transformation.	problems	76 to 89; Average: 56			the problem	
	extreme stresses,	probleme	0 to 55			The lecturer	
	beams, buckling in		Forms of Assessment			learning	
	vertical beam		:			objectives,	
	energy methods for		Participatory Activities,			explains the	
	structural deflection		Portfolio Assessment,			required,	
	anaiyais		r racuce / renutifiance			motivates	
						students towards the	
						problem that	
						will be chosen •	
						Phase 2: Organizes	
						students to	
						study Lecturer	
						nelps students	
						organize	
						learning tasks	
						related to the	
						chosen in	
						Matkul Mekban	
						2 Students	
						observations in	
						the field	
						through articles	
						until they find	
			1	1		,	
						the topic of the	
						the topic of the problem Phase	

I I I I I I I I I I I I I I I I I I I	estigation turers ourage lents to ain ropriate rmation to ist in ing isted blems or e studies ted to the chanics and ngth of erials rse 2 dents carry the ctions in by the urer • se 4: elop and sent the ilts of their k. The urer itates lents in
Image: Construction	lents to ain ropriate rmation to ist in ring cted olems or e studies ted to the chanics and ngth of erials rse 2 dents carry the ctions in by the urer • se 4: elop and sent the ilts of their k. The urer itates lents in
stud obta app inform assi solv solv solv solv solv solv solv solv	dents to ain ropriate rrmation to ist in ring cted olems or e studies ted to the chanics and ngth of erials rse 2 dents carry the ctions in by the urer • .se 4: elop and sent the ilts of their k. The urer itates lents in
black	ain ropriate rrmation to ist in ing ceted oblems or e studies ted to the chanics and ngth of erials rse 2 dents carry the ctions n by the urer • .se 4: elop and sent the ilts of their k. The urer itates lents in
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					Students make
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					3: Guiding
					Group
					Lecturers
					encourage
					obtain
					appropriate
					assist in
					solving
					problems or
					case studies
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					strength of
					course 2
					Students carry
					directions
					given by the lecturer •
					Phase 4:
					Develop and present the
					work. The
					lecturer facilitates
					students in
					presenting it in
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					Students
					collect their
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					time limit. •
					Analyze and
					evaluate the
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					evaluation: 2
					(2x50) minutes - Main 1-4
					Grade criteria:
					300; Very
					good: 76 to 89;
					75; Below
					average: 0 to
					References:
					Bear, FP and
					1987. Statics.
					(Mechanics for
					Jakarta:
					Erlangga.
					Material: •
					Phase 1: Orientation to
					the problem
					The lecturer
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			will be chosen •
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			until they find
			problem Phase
			3: Guiding
			Group
			Lecturers
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			mechanics and
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			Phase 4:
			Develop and
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			work. Students
			collect their
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			time limit. •
			Phase 5: Analyze and
			evaluate the
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			Lecturers
			assist students
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			and evaluation:
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			100; Very
			good: 76 to 89;
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			average: 0 to
			55 Deferences
			reierences: Timoshenko. S.
			and Young, DH
			1990. Engineering
			Mechanics.
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			Orientation to
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			3. Guiding Group
			Investigation
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			encourage students to
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			mechanics and
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			lecturer •
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			present the
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			good: 76 to 89:
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					Heinz Frick.
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16		Criteria: Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 Form of Assessment : Participatory Activities, Tests	TEST	Material: Summative Examination Bibliography: Bear, FP and Johnston, ER 1987. Statics. (Mechanics for Engineers), Jakarta: Erlangga.	30%
				Material: Summative Exam Reader: Heinz Frick. 1991. Engineering Mechanics 1 (Statics and Its Uses). Yogyakarta: Kanisius.	
				Material: Summative Examination Bibliography: Timoshenko, S. and Young, DH 1990. Engineering Mechanics. Jakarta: Erlangga.	
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Evaluation Percentage Recap: Case Study

NO	Evaluation	Percentage
1.	Participatory Activities	57.01%
2.	Portfolio Assessment	5.51%
3.	Practice / Performance	7.01%
4.	Test	29.5%
		99.03%

- 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.
- 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.