



**Universitas Negeri Surabaya  
Faculty of Engineering  
Civil Engineering Undergraduate Study Program**

Document Code

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Mechanics of Materials	2220102143	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	2	July 17, 2024
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator	
	.....		.....			Yogie Risdianto, S.T., M.T.	

Learning model	Case Studies
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Program Learning Outcomes (PLO)	PLO study program that is charged to the course	
	Program Objectives (PO)	
	PO - 1	Students are able to analyze the center of gravity and moment of inertia
	PO - 2	Students are able to analyze stress and strain
	PO - 3	Students are able to understand linear elasticity and Hook's law
	PO - 4	Students are able to analyze shear stress and strain
	PO - 5	Students are able to analyze material deformation
	PO - 6	Students are able to analyze strain energy
	PO - 7	Students are able to understand elastic modulus and shear modulus
	PO - 8	Students are able to understand latitude and bending forces
PO - 9	Students are able to analyze stresses in beams	

**PLO-PO Matrix**

	P.O	
	PO-1	
	PO-2	
	PO-3	
	PO-4	
	PO-5	
	PO-6	
	PO-7	
	PO-8	
	PO-9	

**PO Matrix at the end of each learning stage (Sub-PO)**

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		<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> </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																
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<b>Short Course Description</b>	Center of gravity, moment of inertia, normal stress and strain, stress and strain diagram, elasticity, shear stress and strain, axial deformation, bending deformation, stress in inclined section, strain energy, dynamic loading, torsional stress, elastic modulus, shear modulus, energy internal strains, pure shear and pure twisting, latitude and bending forces, stresses in beams, stress and strain analysis																																																																																																																																																																																																										
<b>References</b>	<b>Main :</b> 1. Timoshenko & Gere J.M., alih bahasa Wospakrik H.J., 1987, Mekanika Bahan Edisi kedua versi S1, Penerbit Erlangga Jakarta. 2. Suwarno Wirjomartono, 1986, Mekanika Teknik ,Yogyakarta : Universitas Gajah Mada. 3. V.N. Vasirani & M.N Ratwani, "Analysis of Structure" 4. POPOV, " Mechanical of Material "																																																																																																																																																																																																										
	<b>Supporters:</b> 1. Persepsi Mahasiswa Terhadap Efektifitas Pembelajaran Daring MK Bidang Keilmuan Struktur Mahasiswa JTS FT Unesa Dalam Mendukung Program WFH dan Penanggulangan Covid-19																																																																																																																																																																																																										
<b>Supporting lecturer</b>	Muhammad Imaduddin, S.T., M.T. Mochamad Firmansyah Sofianto, S.T., M.Sc., M.T. Meity Wulandari, S.T., M.T. Alwan Gangsar Brilian Putra, S.Tr.T., M.T.																																																																																																																																																																																																										
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 )																																																																																																																																																																																																						
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1	Analyze the center of gravity and moment of inertia	<ol style="list-style-type: none"> <li>1.analyze several concepts of calculating center of gravity and moment of inertia.</li> <li>2.explain the mechanism of center of gravity and moment of inertia.</li> <li>3.explain orally the sequence of calculating the center of gravity and moment of inertia.</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>		Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50	<p><b>Material:</b> Center of gravity and moment of inertia</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p> <hr/> <p><b>Material:</b> Effectiveness of online learning in the field of structural sciences</p> <p><b>Reference:</b> <i>Student Perceptions of the Effectiveness of Online Learning MK in the Field of Science Structure JTS FT Unesa Students in Supporting the WFH Program and Covid-19 Management</i></p>	4%
2	Analyze normal stress and strain.	<ol style="list-style-type: none"> <li>1.Analyze tensile stress and strain</li> <li>2.Analyze compressive stress and strain</li> <li>3.Understand how to create stress and strain graphs</li> <li>4.Explain verbally tensile stress and strain</li> <li>5.Explain verbally compressive stress and strain</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Normal stress and strain</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	4%

3	Analyze normal stress and strain.	<ol style="list-style-type: none"> <li>1. Analyze tensile stress and strain</li> <li>2. Analyze compressive stress and strain</li> <li>3. Understand how to create stress and strain graphs</li> <li>4. Explain verbally tensile stress and strain</li> <li>5. Explain verbally compressive stress and strain</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Normal stress and strain</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	3%
4	Explain linear elasticity and Hook's law	<ol style="list-style-type: none"> <li>1. Explain the meaning of elasticity</li> <li>2. Explain Hook's law</li> <li>3. Explain the concept of poisson ratio numbers</li> <li>4. Explain orally the meaning of elasticity</li> <li>5. Explain orally the concept of Hook's law</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Linear elasticity and Hook's law</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	3%
5	Analyze shear stress and strain	<ol style="list-style-type: none"> <li>1. Explain the concepts of shear stress and strain</li> <li>2. Analyze shear stress and strain</li> <li>3. Explain verbally shear stress and strain</li> </ol>	<p><b>Criteria:</b> Listen actively to the material explained by the lecturer. Discuss the concept of shear stress and strain. Discuss stress and strain analysis in materials.</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Shear stress and strain</p> <p><b>References:</b></p>	4%
6	Analyze bending deformation and axial deformation.	<ol style="list-style-type: none"> <li>1. Analyze the deformation of bending structures</li> <li>2. Analyzing deformation in compression members</li> <li>3. Explain verbally flexural and compressive deformations</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Bending deformation Axial deformation 2 X 50		<p><b>Material:</b> Flexural deformation and axial deformation</p> <p><b>References:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	3%

7	Analyze bending deformation and axial deformation.	<ol style="list-style-type: none"> <li>Analyze the deformation of bending structures</li> <li>Analyzing deformation in compression members</li> <li>Explain verbally flexural and compressive deformations</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Bending deformation Axial deformation 2 X 50		<p><b>Material:</b> Flexural deformation and axial deformation</p> <p><b>References:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	4%
8	Midterm exam	-	<p><b>Criteria:</b> -</p> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	- 2 X 50			20%
9	Analyzing Strain Energy	<ol style="list-style-type: none"> <li>Explain the concept of strain energy</li> <li>Analyzing strain energy</li> <li>Explain orally the strain energy</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Strain energy</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	4%
10	Analyze the elastic modulus and shear modulus	<ol style="list-style-type: none"> <li>Explain the concept of elastic modulus</li> <li>Explain the concept of shear modulus</li> <li>Explain orally the elastic modulus and shear modulus</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Elastic modulus and shear modulus</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	0%
11	Analyze pure shear and pure twist	<ol style="list-style-type: none"> <li>Explains the concept of sliding and pure punter</li> <li>Analyzing pure Shear</li> <li>Analyzing pure twisting</li> <li>Explain orally the concepts of pure shear and twisting</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Pure shear and pure twisting</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	3%

12	Analyze pure shear and pure twist	<ol style="list-style-type: none"> <li>1.Explains the concept of sliding and pure punter</li> <li>2.Analyzing pure Shear</li> <li>3.Analyzing pure twisting</li> <li>4.Explain orally the concepts of pure shear and twisting</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Pure shear and pure twisting</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	4%
13	Analyze latitude and bending forces	<ol style="list-style-type: none"> <li>1.Explain the concepts of latitude and bending forces</li> <li>2.Analyzing latitude forces</li> <li>3.Analyzing Bending Force</li> <li>4.Explain orally the concepts of latitude and bending forces</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> latitudinal forces and bending forces</p> <p><b>References:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	4%
14	Analyze latitude and bending forces	<ol style="list-style-type: none"> <li>1.Explain the concepts of latitude and bending forces</li> <li>2.Analyzing latitude forces</li> <li>3.Analyzing Bending Force</li> <li>4.Explain orally the concepts of latitude and bending forces</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Latitude and bending forces</p> <p><b>Reference:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	5%
15	Analyzing Stresses in beams	<ol style="list-style-type: none"> <li>1.Explain the concept of internal stress in beams</li> <li>2.Describe the cross-sectional stress and strain diagram</li> <li>3.Analyzing internal stresses in beams</li> <li>4.Explain verbally the concept of internal stress in beams</li> </ol>	<p><b>Criteria:</b> Perfect score if answered well and correctly</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Collaborative Learning Approach (Lecture, discussion and question and answer) 2 X 50		<p><b>Material:</b> Stress in beams</p> <p><b>Bibliography:</b> <i>Timoshenko &amp; Gere JM, translated by Wospakrik HJ, 1987, Mechanics of Materials Second edition S1 version, Erlangga Publisher Jakarta.</i></p>	5%
16	UAS	-	<p><b>Criteria:</b> -</p> <p><b>Form of Assessment :</b> Test</p>	Written test 2 X 50			30%

#### Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	51.5%
2.	Project Results Assessment / Product Assessment	8.5%
3.	Test	40%
		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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.