



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																	
Engineering Materials Science	8320302252		T=2 P=0 ECTS=3.18	6	July 18, 2024																																	
AUTHORIZATION	SP Developer		Course Cluster Coordinator		Study Program Coordinator																																	
		Ir. Wahyu Dwi Kurniawan, S.Pd., M.Pd.																																	
Learning model	Case Studies																																					
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																					
	Program Objectives (PO)																																					
	PLO-PO Matrix																																					
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 100px; height: 30px;">P.O</td> </tr> </table>					P.O																															
P.O																																						
	PO Matrix at the end of each learning stage (Sub-PO)																																					
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td rowspan="2" style="width: 50px; height: 30px;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;">2</td> <td style="width: 20px;">3</td> <td style="width: 20px;">4</td> <td style="width: 20px;">5</td> <td style="width: 20px;">6</td> <td style="width: 20px;">7</td> <td style="width: 20px;">8</td> <td style="width: 20px;">9</td> <td style="width: 20px;">10</td> <td style="width: 20px;">11</td> <td style="width: 20px;">12</td> <td style="width: 20px;">13</td> <td style="width: 20px;">14</td> <td style="width: 20px;">15</td> <td style="width: 20px;">16</td> </tr> </table>					P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																						
Short Course Description	This course discusses theoretical understanding of material formation processes, definition of scope, concepts regarding material formation processes. Understanding electron nomenclature, atomic and crystal structures, chemical bonds and metallic bonds, classification of engineering materials, mechanical properties of materials, mechanical testing, crystal structure, Miller index, crystallization, defects in crystals, phase diagrams, ferrous metals, metals non ferrous, polymers, composites and metal alloys.																																					
References	Main :																																					
	<ol style="list-style-type: none"> 1. Avner, Sidney. 1974. "Introduction To Physical Metallurgy 2nd Edition". Cuny, New York : Mc Graw-Hill 2. Dieter, George E. 1986. "Metalurgi Mekanik jilid 1". Edisi 3 3. Dieter, George E. 1990. " Metalurgi Mekanik Jilid 2". Edisi 3 Volume 2 4. Dieter, George E. 1986. "Mechanical Metallurgy 3rd". New York : Mc Graw-Hill 5. Smallman, R.E. and Bishop, R.J. 1999. " Modern Physical Metallurgy and Materials Engineering 6th Edition". UK : Butterworth-Heinemann 7. Suherman, Wahid, Ir. 1987. "Pengetahuan Bahan". Edisi Pertama 																																					
	Supporters:																																					
Supporting lecturer																																						
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)																																	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)																															

1	<p>Know the definition of technical materials</p> <p>Understand the stages of selecting engineering materials</p> <p>Understand the properties of materials</p> <p>Understand testing on materials</p> <p>Able to ask questions from the material presented</p> <p>Able to answer questions effectively</p>	<p>Able to explain the definition of technical materials</p> <p>Able to explain the stages of selecting technical materials</p> <p>Able to explain testing on materials</p> <p>Able to explain the stages of testing on materials</p> <p>Able to explain the process stages of technical materials</p> <p>Able to describe the process stages of technical materials</p> <p>Able to discuss in effective language the material presented</p>	<p>Criteria:</p> <p>1. If you are able to answer all questions correctly you will get a score of 100. 2. If you can answer two questions correctly you will get a score of 70. 3. If you can answer one question correctly you will get a score of 40.</p>	<p>Lectures and Questions and Answers</p> <p>2 X 50</p>		0%
2	<p>Know the definition of technical materials</p> <p>Understand the stages of selecting engineering materials</p> <p>Understand the properties of materials</p> <p>Understand testing on materials</p> <p>Able to ask questions from the material presented</p> <p>Able to answer questions effectively</p>	<p>Able to explain the definition of technical materials</p> <p>Able to explain the stages of selecting technical materials</p> <p>Able to explain testing on materials</p> <p>Able to explain the stages of testing on materials</p> <p>Able to explain the process stages of technical materials</p> <p>Able to describe the process stages of technical materials</p> <p>Able to discuss in effective language the material presented</p>	<p>Criteria:</p> <p>1. If you are able to answer all questions correctly you will get a score of 100. 2. If you can answer two questions correctly you will get a score of 70. 3. If you can answer one question correctly you will get a score of 40.</p>	<p>Lectures and Questions and Answers</p> <p>2 X 50</p>		0%
3	<p>Understand atomic concepts</p> <p>Understand atomic bonds</p> <p>Understand metallic bonds</p>	<p>Describe atoms in materials</p> <p>Explain types of atomic bonds</p> <p>Describe types of atomic bonds</p> <p>Be able to answer questions in writing</p>	<p>Criteria:</p> <p>1. If you are able to answer 4 questions correctly you will get a score of 100</p> <p>2. If you can answer 3 questions correctly you will get a score of 75</p> <p>3. If you can answer 2 questions correctly you will get a score of 50</p> <p>4. If you can answer 1 question correctly you will get a score of 25</p>	<p>Lectures and written assignments</p> <p>2 X 50</p>		0%
4	<p>Able to understand the crystal structure of materials (metals)</p>	<p>Able to explain the definition of crystal structure in metals</p> <p>Able to explain unit cells and lattices</p> <p>Able to explain various types of crystal lattices</p> <p>Able to describe face centered cubic, body centered cubic and hexagonal closed pack</p> <p>Able to answer questions from the material given in writing and orally</p>	<p>Criteria:</p> <p>1. If you are able to answer all the questions correctly you will get a score of 100</p> <p>2. If you can answer 3 questions correctly you will get a score of 75</p> <p>3. If you can answer 2 questions correctly you will get a score of 50</p> <p>4. If you can answer 1 question correctly you will get a score of 25</p>	<p>Live lectures and questions and answers</p> <p>2 X 50</p>		0%

5	Understanding shear planes in crystal structures. Knowing how to determine the side lengths of a cube in a crystal plane. Knowing how to determine the Miller index in a crystal plane	Explaining shear planes in crystal structures Describing shear planes Describing how to determine the side length of a cube in a crystal plane Explaining how to determine the Miller index Describing crystal planes using the Miller index	Criteria: 1. If you are able to answer all the questions correctly you will get a score of 100 2. If you can answer 4 questions correctly you will get a score of 80 3. If you can answer 3 questions correctly you will get a score of 60 4. If you can answer 2 questions correctly you will get a score of 40 5. If you are able to answer 1 question correctly you will get a score of 20 6. If you can answer 0 questions correctly you will get a score of 0.	Lectures, discussions and questions and answers 2 X 50			0%
6	Understanding shear planes in crystal structures. Knowing how to determine the side lengths of a cube in a crystal plane. Knowing how to determine the Miller index in a crystal plane	Explaining shear planes in crystal structures Describing shear planes Describing how to determine the side length of a cube in a crystal plane Explaining how to determine the Miller index Describing crystal planes using the Miller index	Criteria: 1. If you are able to answer all the questions correctly you will get a score of 100 2. If you can answer 2 questions correctly you will get a score of 70 3. If you can answer 1 question correctly you will get a score of 35 4. If you cannot answer all the questions correctly you will get a score of 0	Lectures, discussions and questions and answers 2 X 50			0%
7	Understand the process of crystallization and recrystallization Understand defects in crystals Understand the process of cold working on materials Understand the process of plastic deformation in crystals	Explain the processes of crystallization and recrystallization Explain the defects in crystals Describe the defects in crystals Analyze the defects in crystals Explain the process of cold working on materials Explain the process of plastic deformation Classify deformations in crystals	Criteria: 1. If you are able to answer all the questions correctly, you will get a score of 100. 2. If you can answer 3 questions correctly, you will get a score of 75. 3. If you can answer 2 questions correctly, you will get a score of 50. 4. If you can answer 1 question correctly, you will get a score of 25. 4. If you cannot answer all the questions you will get a 0 mark	Lectures, discussions and questions and answers 2 X 50			0%
8	Sub Summative Exam	Sub Summative Exam	Criteria: Sub Summative Exam	Written Test 2 X 50			0%

9	Understand the meaning of iron and steel Understand how to refine iron	Explain the manufacture of iron and steel Describe the manufacture of iron and steel Analyze the refining of iron Describe how iron is purified	Criteria: 4 The presentation was carried out coherently, with appropriate intonation and emphasis, showing a good understanding of the concept, with the help of ppt media according to media criteria, correct answers to the questioner, able to formulate suggestions for improvement 3 The presentation was carried out coherently, with appropriate intonation and emphasis, but lacking in depth some understanding of the concept, assistance can be via ppt media according to media criteria, answers from the questioner are generally correct, able to formulate suggestions for improvement 2. Presentation is carried out, less coherent and/or shows lack of understanding of several concepts, assistance via ppt media but does not meet media criteria , the answer from the questioner is generally incorrect, able to formulate suggestions for improvement 1 Presentation is made, but is not coherent and/or shows lack of understanding of many concepts, does not use ppt media, answer from the questioner is incorrect, unable to formulate suggestions for improvement	Lectures, discussions and questions and answers 2 X 50			0%
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10	Understanding about steel making Understanding the uses of steel	Describe how steel is made Analyze how steel is made Explain the uses of steel Exemplify the uses of steel Analyze the uses of steel in the industrial world	Criteria: 4 The presentation was carried out coherently, with appropriate intonation and emphasis, showing a good understanding of the concept, with the help of ppt media according to media criteria, correct answers to the questioner, able to formulate suggestions for improvement 3 The presentation was carried out coherently, with appropriate intonation and emphasis, but lacking in depth some understanding of the concept, assistance can be via ppt media according to media criteria, answers from the questioner are generally correct, able to formulate suggestions for improvement 2 Presentation is carried out, less coherent and/or shows lack of understanding of several concepts, assistance via ppt media but does not meet media criteria, the answer from the questioner is generally incorrect, able to formulate suggestions for improvement 1 Presentation is carried out, but lacks consistency and/or shows lack of understanding of many concepts, does not use ppt media, answer from	Lectures, discussions and questions and answers 2 X 50			0%
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11	Understanding about non-ferrous metals	Explaining non-ferrous metals Analyzing non-ferrous metals	Criteria: 4 The presentation was carried out coherently, with appropriate intonation and emphasis, showing a good understanding of the concept, with the help of ppt media according to media criteria, correct answers to the questioner, able to formulate suggestions for improvement 3 The presentation was carried out coherently, with appropriate intonation and emphasis, but lacking in depth some understanding of the concept, assistance can be via ppt media according to media criteria, answers from the questioner are generally correct, able to formulate suggestions for improvement 2 Presentation is carried out, less coherent and/or shows lack of understanding of several concepts, assistance via ppt media but does not meet media criteria, the questioner's answer is generally incorrect, able to formulate suggestions for improvement	Lectures, discussions and questions and answers 2 X 50			0%
12	Able to understand non-metallic materials	Able to explain non-metallic materials. Able to give examples of non-metallic materials. Able to classify non-metallic materials	Criteria: 1. If you are able to answer all the questions correctly, you will get a score of 100. 2. If you can answer 3 questions correctly, you will get a score of 75. 3. If you can answer 2 questions correctly, you will get a score of 50. 4. If you can answer 1 question correctly, you will get a score of 25. 5. If you are unable to answer all the questions you will get a score of 0	Lectures, discussions and questions and answers 2 X 50			0%
13	Understand the composition of alloys in a material. Understand the phase diagram. Understand the iron-iron carbide balance diagram	Explaining the composition of alloys of a material Describing the composition of alloys of a material Explaining phase diagrams Drawing phase diagrams Analyzing phase diagrams	Criteria: 1. If you are able to answer all questions correctly, you will get a score of 100. 2. If you can answer 1 question correctly, you will get a score of 50.	Lectures, discussions and questions and answers 2 X 50			0%

14	Understand the composition of alloys in a material. Understand the phase diagram. Understand the iron-iron carbide balance diagram	Explaining the composition of alloys of a material Describing the composition of alloys of a material Explaining phase diagrams Drawing phase diagrams Analyzing phase diagrams	Criteria: 1. If you are able to answer all the questions, you will get a score of 100. 2. If you are able to answer 1 question, you will get a score of 50.	Lectures, discussions and questions and answers 2 X 50		0%
15	Using the iron carbide diagram to determine the carbon content in a material	Explaining the iron-iron carbide balance diagram Describing the iron-carbide balance diagram Analyzing the iron-iron carbide balance diagram to determine the value of carbon content in a material	Criteria: 1. If you are able to answer all questions correctly, you will get a score of 100. 2. If you can answer 2 questions correctly, you will get a score of 70. 3. If you can answer 1 question correctly, you will get a score of 40.	Lectures, discussions and questions and answers 2 X 50		0%
16	Final exams	Final exams	Criteria: Written Exam	Written Exam 2 X 50		0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

Notes

- 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.
- 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.
- 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.
- 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.
- 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.
- Forms of assessment:** test and non-test.
- 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.
- 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.
- Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 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%.
- TM=Face to face, PT=Structured assignments, BM=Independent study.