	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
Materials Science I	8320302036		T=2	P=0	ECTS=3.18	2	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

	P.O

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

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	Understanding the theory of material formation processes, definition of scope, concepts regarding the process of material formation. Understanding of electron nomenclature, atomic and crystal structures, chemical bonds and metallic bonds, classification of engineering materials, mechanical properties of materials, phase diagrams for the formation of materials: ferrous metals, non-ferrous metals, polymers, composites and alloys, as well as treatments: digestion, foundry, casting.
References	**Main :**
	1. Srieati Japri : 1D*Ilmu dan Teknologi Bahan*1D. Avner, Sidney H., 1C*Introduction to Physical Metallurgy*1C. Vlak Van. 1D*Ilmu dan Teknologi Bahan*1C . Surdia, Tata. 1C*Pengetahuan Bahan Teknik*1C.
	Supporters:
Supporting lecturer	Arya Mahendra Sakti, S.T., M.T. Andita Nataria Fitri Ganda, S.T., M.Sc.

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	Know the definition of engineering materials Understand the definition of an atom	Explaining the definition of engineering materials Analyzing the uses of engineering materials Explaining the definition of atoms Describing atoms in materials	**Criteria:** According to the Rubric	Lectures, discussions and questions and answers 2 X 50			0%
2	Understand the stages of engineering materials processes. Understand atomic bonds	Explaining the stages of the engineering materials process. Describing the stages of the engineering materials process. Explaining the types of atomic bonds. Describing the types of atomic bonds	**Criteria:** According to the Rubric	Lectures, discussions and questions and answers 2 X 50			0%
3	Understand crystal structure	Explaining the crystal structure of materials Describing the crystal structure		Lectures, discussions and questions and answers 2 X 50			0%
4	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		Lectures, discussions and questions and answers 4 X 50			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		Lectures, discussions and questions and answers 4 X 50			0%
6	Understanding defects in crystals Understanding plastic deformation processes in crystals Understanding cold working processes in materials	Explaining defects in crystals Describing defects in crystals Analyzing defects in crystals Explaining the process of cold working materials		Lectures, discussions and questions and answers 2 X 50			0%

7	Understand the recrystallization process Understand the meaning of iron and steel Understand how to purify iron	Explain the recrystallization process Describe the recrystallization process Explain the manufacture of iron and steel Describe the manufacture of iron and steel Analyze iron refining Describe how iron is purified		Lectures, discussions and questions and answers 2 X 50			0%
8	MUnderstand about steel making Understand 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		Lectures, discussions and questions and answers 2 X 50			0%
9				2 X 50			0%
10	Understanding non-ferrous metals Understanding the composition of alloys in a material Understanding phase diagrams Understanding iron-iron carbide balance diagrams Using iron carbide diagrams to determine the carbon content in a material	Explaining non-ferrous metals Analyzing non-ferrous metals Explaining the alloy composition of a material Describing the alloy composition of a material Explaining phase diagrams Drawing phase diagrams Analyzing phase diagrams Explaining iron-iron carbide balance diagrams Describing iron-iron carbide balance diagrams Analyzing iron-iron carbide balance diagrams for knowing the value of carbon content in a material		Lectures, discussions and questions and answers 2 X 50			0%

11	Understanding non-ferrous metals Understanding the composition of alloys in a material Understanding phase diagrams Understanding iron-iron carbide balance diagrams Using iron carbide diagrams to determine the carbon content in a material	Explaining non-ferrous metals Analyzing non-ferrous metals Explaining the alloy composition of a material Describing the alloy composition of a material Explaining phase diagrams Drawing phase diagrams Analyzing phase diagrams Explaining iron-iron carbide balance diagrams Describing iron-iron carbide balance diagrams Analyzing iron-iron carbide balance diagrams for knowing the value of carbon content in a material		Lectures, discussions and questions and answers 2 X 50			0%
12	Understanding non-ferrous metals Understanding the composition of alloys in a material Understanding phase diagrams Understanding iron-iron carbide balance diagrams Using iron carbide diagrams to determine the carbon content in a material	Explaining non-ferrous metals Analyzing non-ferrous metals Explaining the alloy composition of a material Describing the alloy composition of a material Explaining phase diagrams Drawing phase diagrams Analyzing phase diagrams Explaining iron-iron carbide balance diagrams Describing iron-iron carbide balance diagrams Analyzing iron-iron carbide balance diagrams for knowing the value of carbon content in a material		Lectures, discussions and questions and answers 2 X 50			0%
13	MUnderstanding the mechanical properties of materials, destructive testing and non-destructive testing on materials MUnderstanding non-metallic materials	Explaining the mechanical properties of materials Exemplifying the mechanical properties of materials Analyzing the mechanical properties of materials Explaining non-metallic materials Exemplifying non-metallic materials Classifying non-metallic materials		Lectures, discussions and questions and answers 2 X 50			0%

14	MUnderstanding the mechanical properties of materials, destructive testing and non-destructive testing on materials MUnderstanding non-metallic materials	Explaining the mechanical properties of materials Exemplifying the mechanical properties of materials Analyzing the mechanical properties of materials Explaining non-metallic materials Exemplifying non-metallic materials Classifying non-metallic materials		Lectures, discussions and questions and answers 2 X 50			0%
15	MUnderstanding the mechanical properties of materials, destructive testing and non-destructive testing on materials MUnderstanding non-metallic materials	Explaining the mechanical properties of materials Exemplifying the mechanical properties of materials Analyzing the mechanical properties of materials Explaining non-metallic materials Exemplifying non-metallic materials Classifying non-metallic materials		Lectures, discussions and questions and answers 2 X 50			0%
16				2 X 50			0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

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** 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.