	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Physics Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Materials Science	4520103232	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	3	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-5	Able to demonstrate as a good scientist, critical thinking skills and innovation in research and professional fields.
	PLO-12	Have the ability to improve their knowledge and be able to continue their studies to a higher level.
	PLO-13	Demonstrate knowledge of Classical Physics and Modern Physics
	Program Objectives (PO)	
	PO - 1	Students are able to demonstrate and master knowledge related to material physics and their applications
	PO - 2	Students are able to improve their knowledge in the field of materials physics as a provision to continue their study at a higher level
	PO - 3	Students are able to use critical thinking processes in analyzing data and information on research results in the field of materials physics

PLO-PO Matrix

P.O	PLO-5	PLO-12	PLO-13
PO-1			
PO-2			
PO-3			

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
PO-1																
PO-2																
PO-3																

Short Course Description	This course is a basic course to understand materials science and engineering, material classification, modern materials needed, atomic structure and bonds between atoms, solid crystal structure and metal mechanical properties, as well as understanding their application in life.
References	**Main :**

1. Callister, William D., 2007, Materials Science and Engineering: An Introduction , 7ed, New York: John Wiley & Sons.
2. Van Vlack, 1992, Ilmu dan Teknologi Bahan , Jakarta: Erlangga.
3. Artikel jurnal nasional dan internasional

Supporters:

Supporting lecturer	Diah Hari Kusumawati, S.Si., M.Si. Nugrahani Primary Putri, S.Si., M.Si.

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	Students are able to identify and classify materials according to their properties	1.1. Identify 5 (five) differences in material properties based on their classification 2.2. Describe the 3 (three) components (design, production, and use) of the material, and be able to state the relationship between these components 3.3. Explain the classification of solid materials	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion 3 x 50	Discussion 3 x 50	**Materials:** ch 1 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	2%
2	Students can explain the structure of atoms and bonds between atoms in materials	1.1. Identify the bonds between atoms in materials 2.2. Classifying the bonds between atoms in materials 3.3. Determine the electron configuration model of a material 4.4. Describe the structure of atoms in materials 5.5. Tabulate the different types of atomic bonds in materials	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practice/Performance	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch 2 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%

3	Students can explain the structure of atoms and bonds between atoms in materials	1.1. Identify the bonds between atoms in materials 2.2. Classifying the bonds between atoms in materials 3.3. Determine the electron configuration model of a material 4.4. Describe the structure of atoms in materials 5.5. Tabulate the different types of atomic bonds in materials	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practice/Performance	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch 2 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%
4	Students can explain and analyze the crystal structure of solids	1.1. Identify the crystal structure of a material 2.2. Distinguish between different types of crystal structures in materials 3.3. Determine the Miller index of a crystal plane 4.4. Analyzing the crystal plane of a material	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch 3 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%
5	Students can explain and analyze the crystal structure of solids	1.1. Identify the crystal structure of a material 2.2. Distinguish between different types of crystal structures in materials 3.3. Determine the Miller index of a crystal plane 4.4. Analyzing the crystal plane of a material	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch 3 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%

6	Students can explain the mechanical properties of materials and apply them in life	1.1. Distinguish between plastic deformation and elastic deformation of a material 2.2. Marking areas of elastic and plastic deformation on the tensile stress-strain curve of a material 3.3. Determine the yield criteria of a material 4.4. Analyzing the tensile stress-strain curve of the tensile test results of the material	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practice/Performance	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch. 6 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%
7	Students can explain the mechanical properties of materials and apply them in life	1.1. Distinguish between plastic deformation and elastic deformation of a material 2.2. Marking areas of elastic and plastic deformation on the tensile stress-strain curve of a material 3.3. Determine the yield criteria of a material 4.4. Analyzing the tensile stress-strain curve of the tensile test results of the material	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Participatory Activities, Practice/Performance	Discussion 3 x 50	Discussion 3 x 50	**Material:** Ch. 6 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	5%
8	1.Students are able to identify and classify materials according to their properties 2.Students can explain the structure of atoms and bonds between atoms in materials 3.Students can explain and analyze the crystal structure of solids 4.Students can explain the mechanical properties of materials and apply them in life	Students can identify the types of materials, can explain the structure and properties of materials	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Test	UTS 2 x 50	UTS 2 x 50	**Materials:** Ch 1, 2, 3, 6 **Bibliography:** *Callister, William D., 2007, Materials Science and Engineering: An Introduction, 7ed, New York: John Wiley & Sons.*	10%

9	Students are able to improve their knowledge of materials physics from the analysis of previous research results	1.1. Students are able to understand the results of previous research on materials physics topics 2.2. Students are able to explain the results of previous research with topics related to materials physics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion 3 x 50	Discussion 3 x 50	**Material:** Introduction section and research methods **References:** *National and international journal articles*	5%
10	Students are able to improve their knowledge of materials physics from the analysis of previous research results	1.1. Students are able to understand the results of previous research on materials physics topics 2.2. Students are able to explain the results of previous research with topics related to materials physics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion 3 x 50	Discussion 3 x 50	**Material:** Introduction section and research methods **References:** *National and international journal articles*	5%
11	Students are able to improve their knowledge of materials physics from the analysis of previous research results	1.1. Students are able to understand the results of previous research on materials physics topics 2.2. Students are able to explain the results of previous research with topics related to materials physics	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion 3 x 50	Discussion 3 x 50	**Material:** Introduction section and research methods **References:** *National and international journal articles*	5%
12	Students are able to use critical thinking processes in analyzing data and information obtained from previous research in the field of materials physics	1.1. Students are able to correlate and analyze the results of previous research 2.2. Students are able to draw conclusions from the results of the analysis that has been carried out	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and presentation 3 x 50	Discussion and presentation 3 x 50	**Material:** All parts of the article **Bibliography:** *National and international journal articles*	5%

13	Students are able to use critical thinking processes in analyzing data and information obtained from previous research in the field of materials physics	1.1. Students are able to correlate and analyze the results of previous research 2.2. Students are able to draw conclusions from the results of the analysis that has been carried out	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and presentation 3 x 50	Discussion and presentation 3 x 50	**Material:** All parts of the article **Bibliography:** *National and international journal articles*	5%
14	Students are able to use critical thinking processes in analyzing data and information obtained from previous research in the field of materials physics	1.1. Students are able to correlate and analyze the results of previous research 2.2. Students are able to draw conclusions from the results of the analysis that has been carried out	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and presentation 3 x 50	Discussion and presentation 3 x 50	**Material:** All parts of the article **Bibliography:** *National and international journal articles*	5%
15	Students are able to use critical thinking processes in analyzing data and information obtained from previous research in the field of materials physics	1.1. Students are able to correlate and analyze the results of previous research 2.2. Students are able to draw conclusions from the results of the analysis that has been carried out	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion and presentation 3 x 50	Discussion and presentation 3 x 50	**Material:** All parts of the article **Bibliography:** *National and international journal articles*	5%
16	1.Students are able to improve their knowledge of materials physics from the analysis of previous research results 2.Students are able to use critical thinking processes in analyzing data and information obtained from previous research in the field of materials physics	1.1. Students are able to understand the results of previous research on materials physics topics 2.2. Students are able to explain the results of previous research with topics related to materials physics 3.3. Students are able to correlate and analyze the results of previous research 4.4. Students are able to draw conclusions from the results of the analysis that has been carried out	**Criteria:** Students will get full marks if they meet the assessment indicators **Form of Assessment** : Project Results Assessment / Product Assessment	Presentation 3 x 50	Presentation 3 x 50	**Material:** All parts of the article **Bibliography:** *National and international journal articles*	23%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	22%
2.	Project Results Assessment / Product Assessment	58%
3.	Practice / Performance	10%
4.	Test	10%
		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** 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.