	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
Material Defects	4520102028		T=2	P=0	ECTS=3.18	0	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Prof. Dr. Munasir, S.Si., M.Si.

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	Study the concept of crystal defects in solid materials, point defects, line defects: dislocations, two-dimensional defects: interfaces, and volume defects. The simplest point defect is a vacancy, where there are missing atoms in the crystal. Interstitial self is generally known as Frenkel-Defect and vacancy of ion pairs is known as Schootky-Defect. Material defects can be overcome by heat treatment until it reaches the recrystallization temperature. An overview of the mechanical properties of materials will also be studied: the stress-strain graph (Young's modulus) which is associated with the phenomenon of defects in solid material bodies and their mechanical properties (strength of materials). Phase transformations due to hot and cold treatment (heattreatment, aging) will also be discussed.
References	**Main :**

1. William D. Calister Jr . 2001. Fundamental of Materials Science and Enginnering . New York, John Willey & Sons. Inc.
2. Charless Kittel . 2002. Introduction to Solid State Physics . New York, John willey & Sons. Inc.
3. A.K. Head, P. Humble, L.M. Clarebrough, A.J. Morton and C.T. Forwood. 2017. Defects in Crystalline Solids: Computed Electron Micrographs and Defect Identification. Elsivier BV All rights reseved. http://www.sciencedirect.com/science/bookseries/00703230.
4. Media online tentang defect of solids state : http://www.youtube.com

Supporters:	
Supporting lecturer	Woro Setyarsih, S.Pd., M.Si. Lydia Rohmawati, 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 understand the general concept of material impurity and crystal defects	Able to explain the general concept of material impurity and crystal defects	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Lectures, Question and Answer Discussions and 2 X 50 Assignments			0%

2	Students understand the concept: Point Defects (Vacancy) in the crystalline preparation process	Able to explain the concept of Point Defects (Vacancy) in the crystalline preparation process	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
3	Students can analyze the number of vacancies in material crystals in relation to temperature (T)	Able to explain the concept and principles of vacancies in material crystals in relation to temperature (T)	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
4	Students understand the general concept of line defects	Able to explain the general concept of line defects	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
5	Students understand the general concept of Interfacial defects	Able to explain the general concept of Interfacial defects	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
6	Students understand the concept of Bulk Defect or Volume Defect, atomic vibrations	Able to explain the general concept of Bulk Defect or Volume Defect, atomic vibrations	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
7	Students understand the concept of atomic vibrations and identify material defects with tools	Able to explain the concept of atomic vibrations and microscopic observations	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
8	UTS			2 X 50			0%
9	Students understand the concept and how it works: scanning microscopy, scanning probe microscopy	Able to explain the general concept of how it works: scanning microscopy, scanning probe microscopy	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
10	Students understand the concept of heat treatment (heating) and aging as well as the mechanical properties of metal materials (ferrous and non-ferrous/Aluminium)	Able to explain the concepts of: (heating) and aging as well as the mechanical properties of metal materials (ferrous and non-ferrous/Aluminum)	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
11	Students understand the principles of Aging in aluminum materials: Case study	Able to explain the concept: Aging of aluminum materials: Case study	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
12	Students are able to present the concept of Point Defect (Vacancy) and its application	Able to explain the working principle of the Point Defect (Vacancy) concept and its application	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation: Point Defect (Vacancy) and its Applications, Question and Answer Discussion and Assignment 2 X 50			0%

13	Students are able to present the concept of line defects and their applications	Able to explain the principles of the Line Defect concept and its application	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
14	Students are able to present methods for identifying material defects, principles of atomic vibrations: Microscopy-based (MO, SEM, and TEM)	Able to explain the principles of material defect identification methods, atomic vibration principles: Microscopy-based (MO, SEM, and TEM)	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
15	Students are able to present the engineering concept of crystal/particle size and mechanical properties: Aging Process.	Able to explain the engineering concept of crystal/particle size and mechanical properties: Aging Process	**Criteria:** Maximum test and presentation scores are 100 (same weight)	Presentation, Question and Answer Discussion and Assignment 2 X 50			0%
16	UAS			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.