



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																																																																																			
Polymer Physics	4520102076	Study Program Elective Courses	T=2	P=0	ECTS=3.18	6	July 17, 2024																																																																																			
AUTHORIZATION		SP Developer	Course Cluster Coordinator			Study Program Coordinator																																																																																				
		Nugrahani Primary Putri, M.Si.	Dr. Z. A. Imam Supardi, M.Si.			Prof. Dr. Munasir, S.Si., M.Si.																																																																																				
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-8	Able to make decisions based on data and information in order to fulfill and evaluate responsibilities according to their duties.																																																																																								
	Program Objectives (PO)																																																																																									
	PO - 1	Students master knowledge and science related to polymers and their applications																																																																																								
	PO - 2	Students are able to make decisions based on data and information from research results in the field of polymer physics																																																																																								
	PO - 3	Students are able to use critical thinking processes in analyzing data and information on research results in the field of polymer physics																																																																																								
	PLO-PO Matrix																																																																																									
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>P.O</th> <th>PLO-5</th> <th>PLO-8</th> </tr> </thead> <tbody> <tr> <td>PO-1</td> <td></td> <td></td> </tr> <tr> <td>PO-2</td> <td></td> <td></td> </tr> <tr> <td>PO-3</td> <td></td> <td></td> </tr> </tbody> </table>						P.O	PLO-5	PLO-8	PO-1			PO-2			PO-3																																																																									
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																										
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Short Course Description	In polymer physics courses, students study polymer structure, polymer mechanical characteristics, crystallinity and glass transition phenomena, polymer types, polymer synthesis, electrical, optical and thermal properties, and polymer applications through active learning with a combination of discussion and presentation methods.																																																																																									
References	Main :																																																																																									
	<ol style="list-style-type: none"> 1. Calister, Jr.W.D., 2007, Materials Science and Engineering: An Introduction , Seven Edition, John Wiley & Sons, Inc. 2. Sperling, L.H., 2006, Introduction to Physical Polymer Science , 4th ed, John Wiley & Sons, Inc. 3. Mithcell, Brian S., 2006, An Introduction to Materials Engineering and Science , John Wiley & Sons, Inc. 4. Tim, 2013, Handout Fisika Polimer , Fisika, Unesa, unpublsh work. 5. 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 polymers.	1. Students are able to identify polymer's type	Criteria: Students get full marks if they can identify the types of polymers Form of Assessment : Participatory Activities	100 minute discussion	100 minute discussion	Material: Ch. 14. Polymer Structure Bibliography: <i>Calister, Jr. WD, 2007, Materials Science and Engineering: An Introduction, Seven Edition, John Wiley & Sons, Inc.</i> <hr/> Material: Ch 1 and Ch 2 Reference: <i>Team, 2020, Polymer Physics Handout, Physics, Unesa, unpublished work.</i>	5%
2	Students are able to explain the polymerization process and crystallinity as well as the glass transition in polymer materials	1.1. Classification of polymerization processes on polymeric materials 2.2. Explain the polymerization process in polymer materials	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Participatory Activities, Portfolio Assessment	100 minute discussion	100 minute discussion	Material: Ch 15 References: <i>Calister, Jr. WD, 2007, Materials Science and Engineering: An Introduction, Seven Edition, John Wiley & Sons, Inc.</i> <hr/> Material: Ch 3 References: <i>Team, 2013, Polymer Physics Handout, Physics, Unesa, unpublished work.</i>	5%
3	Students are able to explain the polymerization process and crystallinity as well as the glass transition in polymer materials	1.1. Identifying the crystallinity of polymeric materials 2.2. Explain the degree of crystallinity of polymeric materials 3.3. Explain the process of glass phase transition in polymers	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Participatory Activities	Discussion 2 x 50	Discussion 2 x 50	Material: Ch 14 References: <i>Calister, Jr. WD, 2007, Materials Science and Engineering: An Introduction, Seven Edition, John Wiley & Sons, Inc.</i> <hr/> Material: Ch 4 References: <i>Team, 2013, Polymer Physics Handout, Physics, Unesa, unpublished work.</i>	5%

4	Students are able to identify and explain the mechanical, thermal, and electrical characteristics of polymer materials	<ol style="list-style-type: none"> 1.1. Identify the mechanical properties of polymers 2.2. Describe the various mechanical properties of polymers 3.3. Describe the thermal and optical properties of polymers 4.4. Describe the electrical properties of polymers 	<p>Criteria: Students will get full marks if they meet the assessment indicators</p> <p>Form of Assessment : Participatory Activities</p>	Discussion 2 x 50	Discussion 2 x 50	<p>Material: Ch 15, 18, 19, 21 References: <i>Calister, Jr.WD, 2007, Materials Science and Engineering: An Introduction, Seven Edition, John Wiley & Sons, Inc.</i></p> <p>Material: Ch 5 References: <i>Team, 2013, Polymer Physics Handout, Physics, Unesa, unpublished work.</i></p>	5%
5	Students are able to identify and explain the mechanical, thermal, and electrical characteristics of polymer materials	<ol style="list-style-type: none"> 1.1. Identify the mechanical properties of polymers 2.2. Describe the various mechanical properties of polymers 3.3. Describe the thermal and optical properties of polymers 4.4. Describe the electrical properties of polymers 	<p>Criteria: Students will get full marks if they meet the assessment indicators</p> <p>Form of Assessment : Participatory Activities</p>	Discussion 2 x 50	Discussion 2 x 50	<p>Material: Ch 15, 18, 19, 21 References: <i>Calister, Jr.WD, 2007, Materials Science and Engineering: An Introduction, Seven Edition, John Wiley & Sons, Inc.</i></p> <p>Material: Ch 5 References: <i>Team, 2013, Polymer Physics Handout, Physics, Unesa, unpublished work.</i></p>	5%
6	Students are able to make decisions based on data from research results in the polymer field	Students are able to understand the results of the previous research on polymers.	<p>Criteria: Students will get full marks if they meet the assessment indicators</p> <p>Form of Assessment : Portfolio Assessment</p>	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	<p>Material: research methodology References: <i>National and international journal articles</i></p>	5%
7	Students are able to make decisions based on data from research results in the polymer field	Students are able to understand the results of the previous research on polymers.	<p>Criteria: Students will get full marks if they meet the assessment indicators</p> <p>Form of Assessment : Portfolio Assessment</p>	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	<p>Material: research methodology References: <i>National and international journal articles</i></p>	5%
8	Students are expected to be able to create a reference table containing a comparison of research methods and previous research results from journal articles	Students can create a reference table containing a comparison of research methods and previous research results from journal articles	<p>Criteria: Students will get full marks if they meet the assessment indicators</p> <p>Form of Assessment : Test</p>	Portfolio 2 x 50	Portfolio 2 x 50	<p>Material: Parts of research methods and results References: <i>National and international journal articles</i></p>	10%

9	Students are able to make decisions based on data from research results in the polymer field	1.1. Students are able to understand the results of previous research on polymer topics 2.2. Students are able to explain the results of previous research with topics related to polymers	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Project Results Assessment / Product Assessment	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: Parts of research methods and results References: <i>National and international journal articles</i>	5%
10	Students are able to make decisions based on data from research results in the polymer field	1.1. Students are able to understand the results of previous research on polymer topics 2.2. Students are able to explain the results of previous research with topics related to polymers	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Project Results Assessment / Product Assessment	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: Parts of research methods and results References: <i>National and international journal articles</i>	5%
11	Students are able to make decisions based on data from research results in the polymer field	1.1. Students are able to understand the results of previous research on polymer topics 2.2. Students are able to explain the results of previous research with topics related to polymers	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Project Results Assessment / Product Assessment	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: Parts of research methods and results References: <i>National and international journal articles</i>	5%
12	Students are able to use critical thinking processes in analyzing data and information obtained from previous research	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	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: All parts of the article Bibliography: <i>National and international journal articles</i>	5%
13	Students are able to use critical thinking processes in analyzing data and information obtained from previous research	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	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: All parts of the article Bibliography: <i>National and international journal articles</i>	5%

14	Students can make posters of literature review results	According to the assessment rubric	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Portfolio Assessment	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: All parts of the article Bibliography: <i>National and international journal articles</i>	5%
15	Students can make posters of literature review results	According to the assessment rubric	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Portfolio Assessment	Presentation and discussion 2 x 50	Presentation and discussion 2 x 50	Material: All parts of the article Bibliography: <i>National and international journal articles</i>	5%
16	Students can present the literature review poster they have created	Students can present well-made literature review posters	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Project Results Assessment / Product Assessment, Test	Presentation 2 x 50	Presentation 2 x 50	Material: All parts of the article Bibliography: <i>National and international journal articles</i>	20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	22.5%
2.	Project Results Assessment / Product Assessment	35%
3.	Portfolio Assessment	22.5%
4.	Test	20%
		100%

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.

