



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date																																												
Fracture and Fatigue	2120102022		T=2 P=0 ECTS=3.18	7	July 18, 2024																																												
AUTHORIZATION	SP Developer		Course Cluster Coordinator	Study Program Coordinator																																													
	Ir. Priyo Heru Adiwibowo, S.T., M.T.																																													
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: auto;"> <tr> <td style="width: 30px;">P.O</td> <td colspan="16"></td> </tr> </table>				P.O																																											
P.O																																																	
	PO Matrix at the end of each learning stage (Sub-PO)																																																
	<table border="1" style="margin: auto;"> <tr> <td rowspan="2" style="width: 30px;">P.O</td> <td colspan="16">Week</td> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td> </tr> </table>																P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P.O	Week																																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																	
Short Course Description	The course contains understanding of the theory of fracture mechanics in materials, fracture theory approaches to structural design, fracture and fatigue testing, stress intensity, the effect of notches on stress concentration, fatigue mechanisms, fatigue cracking, calculating the fatigue life of a material.																																																
References	Main :																																																
	1. Dieter,(alih bahasa Djaprie), 1989, MetalurgiMekanik, jilid 1, Erlangga, Jakarta 2. Dieter,(alih bahasa Djaprie), 1989, MetalurgiMekanik, jilid 2, Erlangga, Jakarta 3. SmallmanRE, alih bahasa Djaprie Sriati, MetalurgiFisik Modern, Gramedia Pustaka Utama, Jakarta, 1985 4. Erwalds,Wanhill, 2001, Fracture Mechanic,John Wiley & Son, London 5. Colangelo, VJ., Heiser, FA., 1974, Analysis of Metallurgical Failures, JohnWiley & Son, USA																																																
	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	Understand the scope of fracture and fatigue	<ol style="list-style-type: none"> 1.Understand fracture parameters 2.Understand the relevance of fracture mechanics to structural engineering 3.Understand the stress intensity factor 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
2	Understand fracture mechanisms	<ol style="list-style-type: none"> 1.Understanding brittle fracture 2.Understanding ductile fracture 3.Understanding fatigue cracking 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
3	Understanding stress analysis around the crack tip (I)	<ol style="list-style-type: none"> 1.Understand mode I stress analysis 2.Understand mode II stress analysis 3.Understand mode III stress analysis 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
4	understand stress analysis around the crack tip (II)	<ol style="list-style-type: none"> 1.Understand the correlation of stress around the crack tip with the influence of object dimensions 2.Understand stress analysis around the tip of an elliptical crack 3.Understand voltage transformations 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
5	understanding the plastic region at the crack tip (I)	<ol style="list-style-type: none"> 1.understand plastic area correction by irwin 2.understand plastic area correction by Dugdale 3.understand the shape of the plastic region 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
6	Understanding the plastic region at the crack tip (II)	<ol style="list-style-type: none"> 1.Understanding plastic constraint factors 2.Understand the influence of thickness 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
7	understand the principles of energy	<ol style="list-style-type: none"> 1.understand the rate of energy release 2.understand the criteria for crack propagation 3.understand resistance to cracking (R curve) 		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%

8	UTS	understand the material from meetings 1 to 7		written test 2 X 50			0%
9	understand KIC (Plane strain fracture toughness)	1.understand standardized tests 2.understand the KIC testing procedures		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
10	understand elastic plastic resistance	1.understand fractures with large plastic areas 2.Understanding crack opening displacement (CTOD)		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
11	understanding fatigue crack propagation (I)	1.understand fatigue design criteria 2.understand fatigue at constant amplitude 3.understand loading with varying amplitudes		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
12	understanding fatigue crack propagation (II)	1.understand the influence of the stress ratio (stress ratio: R) 2.understand the life of fatigue crack propagation		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
13	understand fail safety and damage tolerance	1.understand fail safe 2.understand damage tolerance		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
14	understand practical problems in fatigue cracking	1.understand the cracks appearing from the holes 2.understand corner cracks in holes 3.understand combination loads		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
15	understand case applications in fractures	1.understand fractures in structures 2.understand the criteria for leaking before it breaks		lectures, discussions, questions and answers, exercises and assignments 2 X 50			0%
16							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.