



**Universitas Negeri Surabaya**  
**Faculty of Engineering,**  
**Electrical Engineering Undergraduate Study Program**

**Document Code**

**SEMESTER LEARNING PLAN**

<b>Courses</b>	<b>CODE</b>	<b>Course Family</b>	<b>Credit Weight</b>			<b>SEMESTER</b>	<b>Compilation Date</b>																																																																					
Linear Systems	2020103208	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	4	July 17, 2024																																																																					
<b>AUTHORIZATION</b>		<b>SP Developer</b>	<b>Course Cluster Coordinator</b>			<b>Study Program Coordinator</b>																																																																						
		.....	.....			Dr. Lusia Rakhmawati, S.T., M.T.																																																																						
<b>Learning model</b>	<b>Case Studies</b>																																																																											
<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>																																																																											
	<b>Program Objectives (PO)</b>																																																																											
	<b>PO - 1</b>	Mastering the concepts of signals and systems and linear time invariant systems																																																																										
	<b>PO - 2</b>	Able to analyze signals and systems in the time domain and frequency domain																																																																										
	<b>PLO-PO Matrix</b>																																																																											
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td style="text-align: center;">P.O</td></tr> <tr><td style="text-align: center;">PO-1</td></tr> <tr><td style="text-align: center;">PO-2</td></tr> </table>						P.O	PO-1	PO-2																																																																		
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<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																																												
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td></td> <td style="text-align: center;">1</td><td style="text-align: center;">2</td><td style="text-align: center;">3</td><td style="text-align: center;">4</td><td style="text-align: center;">5</td><td style="text-align: center;">6</td><td style="text-align: center;">7</td><td style="text-align: center;">8</td><td style="text-align: center;">9</td><td style="text-align: center;">10</td><td style="text-align: center;">11</td><td style="text-align: center;">12</td><td style="text-align: center;">13</td><td style="text-align: center;">14</td><td style="text-align: center;">15</td><td style="text-align: center;">16</td> </tr> <tr> <td style="text-align: center;">PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="text-align: center;">PO-2</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	Week																	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																		PO-2																	
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PO-1																																																																												
PO-2																																																																												
<b>Short Course Description</b>	Students are able to represent signals and systems, the concept of continuous time Linear Time Invariant (LTI) systems, fourier series of continuous time signals, fourier transformations of continuous time, laplace transformations, concepts of discrete time LTI systems, fourier series of discrete time signals, fourier transformations of discrete time and transformations Z.																																																																											
<b>References</b>	<b>Main :</b>																																																																											
	<ol style="list-style-type: none"> <li>1. Oppenheim, Sinyal Sistem Jilid 1,</li> <li>2. Oppenheim, Sinyal Sistem Jilid 2,</li> <li>3. Jurnal Penelitian yang relevan</li> <li>4. Proceeding (paper) yang relevan</li> </ol>																																																																											
	<b>Supporters:</b>																																																																											
<b>Supporting lecturer</b>	Dr. Lilik Anifah, S.T., M.T. Sayyidul Aulia Alamsyah, S.T., M.T.																																																																											
<b>Week-</b>	<b>Final abilities of each learning stage (Sub-PO)</b>	<b>Evaluation</b>		<b>Help Learning, Learning methods, Student Assignments, [ Estimated time]</b>		<b>Learning materials [ References ]</b>	<b>Assessment Weight (%)</b>																																																																					
		<b>Indicator</b>	<b>Criteria &amp; Form</b>	<b>Offline ( offline )</b>	<b>Online ( online )</b>																																																																							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)																																																																					

1	Able to represent continuous signals and discrete signals in the form of mathematical equations and graphic form, as well as perform operations on signals	Can solve problems regarding signal representation, the form of mathematical signal equations and operations on signals	<b>Criteria:</b> 1. Correct answer to the question 2. Active in discussions  <b>Form of Assessment :</b> Participatory Activities	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 1 Signals and Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%
2	Able to represent continuous signals and discrete signals in the form of mathematical equations and graphic form, as well as perform operations on signals	Can solve problems regarding signal representation, the form of mathematical signal equations and operations on signals	<b>Criteria:</b> 1. Correct answer to the question 2. Active in discussions  <b>Form of Assessment :</b> Participatory Activities	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 1 Signals and Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%
3	1. LTI properties 2. Able to understand the properties of LTI systems and solve convolution problems of discrete and continuous LTI systems	Can solve problems regarding LTI systems and LTI system convolutions in discrete and continuous	<b>Criteria:</b> 1. Active in discussions 2. Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 2 Time-Invariant Linear Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%
4	1. LTI properties 2. Able to understand the properties of LTI systems and solve convolution problems of discrete and continuous LTI systems	Can solve problems regarding LTI systems and LTI system convolutions in discrete and continuous	<b>Criteria:</b> 1. Active in discussions 2. Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities, Tests	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 2 Time-Invariant Linear Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%
5	1. Understanding Fourier Series in discrete time periodic signals 2. Able to understand Fourier series and the properties of Fourier series for continuous and discrete time	In solving problems regarding Fourier series in continuous and discrete time	<b>Criteria:</b> 1. Active in discussions 2. Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities, Tests	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 3 Fourier Series Representation of Periodic Signals <b>Reference:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%
6	1. Understanding Fourier Series in discrete time periodic signals 2. Able to understand Fourier series and the properties of Fourier series for continuous and discrete time	In solving problems regarding Fourier series in continuous and discrete time	<b>Criteria:</b> 1. Active in discussions 2. Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 3 Fourier Series Representation of Periodic Signals <b>Reference:</b> <i>Oppenheim, System Signals Volume 1,</i>	5%

7	Understanding Continuous Time Fourier Transform	Can solve problems regarding continuous time Fourier transform	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Active in discussions</li> <li>2.Able to complete assigned tasks in a timely manner</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<p><b>Material:</b> Chapter 4 Continuous Time Fourier Transformation <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i></p>	10%
8	Able to solve problems regarding the description and representation of signals and systems, Fourier series, and continuous time Fourier transformation	Can solve problems given in evaluation questions	<p><b>Criteria:</b></p> <p>Accurate in answering exam questions</p>	UTS 3 X 50	UTS 3 X 50	<p><b>Material:</b> Chapter 2 Time-Invariant Linear Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i></p> <hr/> <p><b>Material:</b> Chapter 1 to chapter 4 <b>Library:</b> <i>Oppenheim, System Signals Volume 1,</i></p>	5%
9	Understanding the Discrete Time Fourier Transform	Can solve problems regarding discrete time Fourier transforms	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Active in discussions</li> <li>2.Able to complete assigned tasks in a timely manner</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<p><b>Material:</b> Chapter 5 Discrete Time Fourier Transformation <b>Reference:</b> <i>Oppenheim, System Signals Volume 1,</i></p>	10%
10	Understand the time and frequency characteristics of signals	Can solve time and frequency characterization problems in signals	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Active in discussions</li> <li>2.Able to complete assigned tasks in a timely manner</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<p><b>Material:</b> Chapter 1 Characterization of time and frequency in signals and systems <b>Reference:</b> <i>Oppenheim, System Signals Volume 2,</i></p>	5%
11	Understanding signal sampling	Can solve signal sampling problems	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Active in discussions</li> <li>2.Able to complete assigned tasks in a timely manner</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<p><b>Material:</b> Chapter 2 <b>Bibliography Snippet:</b> <i>Oppenheim, System Signals Volume 2,</i></p>	5%
12	Understanding signal sampling	Can solve signal sampling problems	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.Active in discussions</li> <li>2.Able to complete assigned tasks in a timely manner</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<p><b>Material:</b> Chapter 2 <b>Bibliography Snippet:</b> <i>Oppenheim, System Signals Volume 2,</i></p>	5%

13	Understanding the Laplace Transform	Can solve problems regarding the Laplace transformation	<b>Criteria:</b> 1.Active in discussions 2.Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities, Tests	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 4 Laplace Transformation <b>Library:</b> <i>Oppenheim, System Signals Volume 2,</i>	10%
14	Understanding the Z Transformation	Can solve problems regarding the Z transformation	<b>Criteria:</b> 1.Active in discussions 2.Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities, Tests	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 5 Z Transformation <b>Library:</b> <i>Oppenheim, System Signals Volume 2,</i>	10%
15	Understanding Linear Feedback Systems	Can solve problems regarding linear feedback systems	<b>Criteria:</b> 1.Active in discussions 2.Able to complete assigned tasks in a timely manner  <b>Form of Assessment :</b> Participatory Activities, Tests	- Direct Instruction - Problem Based Learning 3 X 50	- Direct Instruction - Problem Based Learning 3 X 50	<b>Material:</b> Chapter 6 Linear Feedback Systems <b>Library:</b> <i>Oppenheim, System Signals Volume 2,</i>	5%
16		Can solve problems given in evaluation questions	<b>Criteria:</b> Accurate in answering exam questions  <b>Form of Assessment :</b> Test	UAS 3 X 50	UAS 3 X 50	<b>Material:</b> Chapter 5 Discrete Time Fourier Transformation <b>Reference:</b> <i>Oppenheim, System Signals Volume 1,</i> <hr/> <b>Material:</b> Chapter 1 - Chapter 6 <b>Library:</b> <i>Oppenheim, System Signals Volume 2,</i>	5%

#### Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	62.5%
2.	Test	32.5%
		95%

#### 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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.