



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

**Document Code**

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Industrial Electrical System Design	2020102025	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	5	April 10, 2023
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator	
	Dr. Ir. Achmad Imam Agung, M.Pd.		Prof. Dr. Bambang Suprianto, M.T.			Dr. Lusia Rakhmawati, S.T., M.T.	

<b>Learning model</b>	<b>Project Based Learning</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>	Able to design system or process components to be applied in the field of electrical engineering																																																																																																																					
	<b>PO - 2</b>	Able to design and carry out experiments in the laboratory/field as well as analyze and interpret data to strengthen engineering assessments																																																																																																																					
	<b>PO - 3</b>	Able to apply modern electrical engineering methods and skills needed to solve problems in the engineering field																																																																																																																					
	<b>PO - 4</b>	Able to plan, complete and evaluate tasks related to the field of electrical engineering																																																																																																																					
	<b>PO - 5</b>	Able to work in cross-disciplinary and cultural arts teams																																																																																																																					
	<b>PLO-PO Matrix</b>																																																																																																																						
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>P.O</td></tr> <tr><td>PO-1</td></tr> <tr><td>PO-2</td></tr> <tr><td>PO-3</td></tr> <tr><td>PO-4</td></tr> <tr><td>PO-5</td></tr> </table>	P.O	PO-1	PO-2	PO-3	PO-4	PO-5																																																																																																															
	P.O																																																																																																																						
PO-1																																																																																																																							
PO-2																																																																																																																							
PO-3																																																																																																																							
PO-4																																																																																																																							
PO-5																																																																																																																							
<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																																																																																							
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> </thead> <tbody> <tr><td>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></tr> <tr><td>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></tr> <tr><td>PO-3</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>PO-4</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>PO-5</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> </tbody> </table>	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																	PO-4																	PO-5																
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																																																																																																																							
PO-4																																																																																																																							
PO-5																																																																																																																							

<b>Short Course Description</b>	Understanding industrial electrical system design in general, equipment, types of conductors and loads in industrial electrical systems, understanding the 2010 Indonesian General Electrical Installation Regulations (PUIL) specifically industrial electrical system design, understanding industrial electrical system design and analysis of load calculations and distribution loads, Understanding of drawing and designing industrial electrical system designs.
---------------------------------	--

<b>References</b>	<b>Main :</b>

<p>1. P. Van Harten. 2001. Instalasi Listrik Arus Kuat 1. Trimitra Mandiri. Panitia Revisi PUIL. 2010. Peraturan Umum Instalasi Listrik. Jakarta: PLN Supari Muslim, dan Joko. 2009. Perencanaan dan Pemasangan Instalasi Penerangan. Jakarta: Dit P-SMK</p>							
<b>Supporters:</b>							
<p>1. Edy Setiawan. 1986. Instalasi Listrik Arus Kuat I. Jakarta: Bina Cipta.</p>							
<b>Supporting lecturer</b>		<p>Dr. Ir. Achmad Imam Agung, M.Pd. Aditya Chandra Hermawan, S.ST., M.T.</p>					
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	Able to understand industrial electrical system design	- Explain the criteria and standards for simple electrical lighting installations in buildings; - Design & draw simple electrical lighting installations for buildings	<p><b>Criteria:</b> EA letters with a number range of 0-100</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentations, group discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 1 <b>Reference:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	5%

2	Able to understand electro mechanical control systems	<ul style="list-style-type: none"> <li>- Explain the criteria and standards for simple electrical lighting installations in multi-storey buildings;</li> <li>- Design &amp; draw simple electrical lighting installations for multi-storey buildings.</li> </ul>	<p><b>Criteria:</b> EA letters with a number range of 0-100</p>	Presentations, discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 2 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	5%
3	Students are able to understand manual controllers/SPST and SPDST	<ul style="list-style-type: none"> <li>- Mention the types of grounding in electrical lighting installations.</li> <li>- Explain the function of grounding in electrical lighting installations.</li> <li>- Designing grounding in building lighting electrical installations, including multi-storey buildings;</li> <li>- Explain the installation of grounding in electrical installations for building lighting, including multi-storey buildings</li> </ul>	<p><b>Criteria:</b> EA letters with a range of 0-100</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentations, discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 3 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	5%

4	Students are able to understand manual controllers/DPST and DPDT	<ul style="list-style-type: none"> <li>- Explain the meaning of Sharing Connection Devices (PHB), components and protection.</li> <li>- Explain the principles in planning Sharing Connection Devices (PHB), components and protection.</li> <li>- Explain the steps in planning Sharing Connection Devices (PHB), components and protection;</li> <li>- Designing and Drawing PHB</li> </ul>	<b>Criteria:</b> EA letters with a range of 0-100	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 4 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	5%
5	Students are able to understand manual controllers/DPST and DPDT	<ul style="list-style-type: none"> <li>- Explain the meaning of Sharing Connection Devices (PHB), components and protection.</li> <li>- Explain the principles in planning Sharing Connection Devices (PHB), components and protection.</li> <li>- Explain the steps in planning Sharing Connection Devices (PHB), components and protection;</li> <li>- Designing and Drawing PHB</li> </ul>	<b>Criteria:</b> EA letters with a range of 0-100	project based learning 2 X 50		<b>Material:</b> Meeting material 4 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	5%

6	Students are able to understand manual controllers/DPST and DPDT	- Explain the basic principles of planning Main PHB and Distribution PHB. - Explain the basic principles of designing and drawing Main PHB and Distribution PHB.	<b>Criteria:</b> EA letters with a range of 0-100	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 6 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	0%
7	Students are able to understand manual controllers/TPST and TPDT	- Explain the benefits of PHB surveys for high-rise buildings. - Conduct PHB surveys of high-rise buildings.	<b>Criteria:</b> EA letters with a range of 0-100  <b>Form of Assessment :</b> Participatory Activities	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 7 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	5%

8	Students are able to understand manual controllers/TPST and TPDT	<ul style="list-style-type: none"> <li>- Redesign PHB for high-rise buildings based on survey results;</li> <li>- Explain the re-design of PHB for high-rise buildings based on survey results</li> </ul>	<b>Criteria:</b> EA letters with a range of 0-100	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 8 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	10%
9	Students are able to understand manual controls/Drum switches and Cam Switches	<ul style="list-style-type: none"> <li>- Explain the meaning of perfect lighting electrical installation;</li> <li>- Explain the main provisions in Perfect Lighting electrical installations.</li> <li>- Explain the calculations for perfect lighting electrical installations.</li> <li>- Make plans for perfect standard lighting installation drawings.</li> </ul>	<b>Criteria:</b> EA letters with a range of 0-100  <b>Form of Assessment :</b> Participatory Activities	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 9 <b>Reader:</b> <i>Edy Setiawan. 1986. Strong Current Electrical Installations I. Jakarta: Bina Cipta.</i>	5%

10	U.S.S	U.S.S	<b>Criteria:</b> EA letters with a range of 0-100	USS 2X50		<b>Material:</b> Meeting material 1-7 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	10%
11	Students are able to plan and draw semi-automatic system controllers	- Explain the meaning of electrical installation for perfect hospital lighting. - Explain the main provisions in electrical installations for perfect hospital lighting. - Explain the calculation of electrical installations for perfect hospital lighting. - Create design plans for perfect hospital lighting installation drawings.	<b>Criteria:</b> EA letters with a range of 0-100  <b>Form of Assessment :</b> Participatory Activities	Presentations, discussions, case studies and reflections 2 X 50		<b>Material:</b> Meeting material 11 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	0%

12	Students are able to plan and draw automatic controllers	<ul style="list-style-type: none"> <li>- Explain the meaning of electrical installation for perfect lighting in a school building.</li> <li>- Explain the main provisions in electrical installations for perfect lighting in school buildings.</li> <li>- Explain the calculations for the electrical installation of perfect lighting for a school building.</li> <li>- Make design plans for perfect lighting installation drawings for school buildings.</li> </ul>	<p><b>Criteria:</b> EA letters with a range of 0-100</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentations, discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 12</p> <p><b>Literature:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	0%
13	Students are able to plan and draw designs for triangular motor controllers equipped with dynamic braking	<ul style="list-style-type: none"> <li>- Explain the meaning of electrical installations for perfect lighting in industrial buildings.</li> <li>- Explain the basic provisions in electrical installations for complete lighting in industrial buildings.</li> <li>- Explain the calculation of electrical installations for perfect lighting for industrial buildings.</li> <li>- Create design plans for perfect lighting installation installations for industrial buildings.</li> </ul>	<p><b>Criteria:</b> EA letters with a range of 0-100</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentations, discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 13</p> <p><b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	5%



14	Students are able to plan and draw a triangular star starting controller with a time delay relay	<ul style="list-style-type: none"> <li>- Explain the meaning of lightning distribution installation.</li> <li>- Explain the main provisions in lightning distribution installations.</li> <li>- Explain the calculations for lightning distribution installations.</li> <li>- Make design plans for lightning distribution installation drawings.</li> </ul>	<p><b>Criteria:</b> EA letters with a range of 0-100</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentations, discussions, case studies and reflections 2 X 50		<p><b>Material:</b> Meeting material 14</p> <p><b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	0%
15	Students are able to plan and draw a triangular star starting controller with a time delay relay	<ul style="list-style-type: none"> <li>- Explain the meaning of lightning distribution installation.</li> <li>- Explain the main provisions in lightning distribution installations.</li> <li>- Explain the calculations for lightning distribution installations.</li> <li>- Make design plans for lightning distribution installation drawings.</li> </ul>	<p><b>Criteria:</b> EA letters with a range of 0-100</p> <p><b>Forms of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	project based learning 2 X 50		<p><b>Material:</b> Meeting material 14</p> <p><b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations 1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i></p>	20%

16	Students are able to design and redraw an industrial electrical system in a particular industry	- Explain the principles of planning electrical installations for lighting for Sports/Special Fields - Mention the steps in planning electrical installations for lighting for Sports/Special Fields	<b>Criteria:</b> EA letters with a range of 0-100	project based learning 2 X 50		<b>Material:</b> Meeting material 1-5 <b>References:</b> <i>P. Van Harten. 2001. Strong Current Electrical Installations</i> <i>1. Trimitra Mandiri. PUIL Revision Committee. 2010. General Electrical Installation Regulations. Jakarta: PLN Supari Muslim, and Joko. 2009. Planning and Installation of Lighting Installations. Jakarta: Directorate of P-SMK</i>	20%
----	---	--	--	----------------------------------	--	---	-----

#### Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	35%
2.	Project Results Assessment / Product Assessment	10%
		45%

#### 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.

