



**Universitas Negeri Surabaya  
Vocational Faculty,  
D4 Civil Engineering Study Program**

Document Code

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Building Utilities and Practicum	2230503015	Architecture	T=3	P=0	ECTS=4.77	3	April 28, 2023
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator	
	Feriza Nadiar, S.T., M.T.		.....			Puguh Novi Prasetyono, S.Pd., M.T.	

<b>Learning model</b>	Project Based Learning
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<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program which is charged to the course</b>																																																																																																					
	<b>Program Objectives (PO)</b>																																																																																																					
	<b>PO - 1</b>	Able to work and be responsible INDEPENDENTLY for any building installation work assigned to him in accordance with established quality standards.																																																																																																				
	<b>PO - 2</b>	Able to develop oneself and think logically and SMARTly in solving problems faced professionally in the field of building installations.																																																																																																				
	<b>PO - 3</b>	Able to interact and work with a team, able to develop oneself and think logically and intelligently in solving problems faced professionally in the field of building installations																																																																																																				
	<b>PO - 4</b>	Operate and apply computer technology in data processing and handling building installation problems in a Tough and HONEST manner																																																																																																				
	<b>PLO-PO Matrix</b>																																																																																																					
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<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																																																																						
	<table border="1" style="margin: 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> </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																
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<b>Short Course Description</b>	Understanding and application of clean water piping installations, dirty water piping, electrical installations and installation planning accompanied by isometric drawings of buildings
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<b>References</b>	<b>Main :</b>

1. Soufyan Moh. Noerbambang dan Takeo Morimura, 2005, Perancangan dan Pemeliharaan Sistem Plumbing , PT. Pradnya Paramitha: Pusat Komunikasi Publik.
2. Poerbo, Hartono, 2002, Bangunan Utilitas, Jakarta : Djambatan.
3. Maryono, 2009, Modul Dasar Instalasi Listrik, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223
4. Ing P. J. M van der Meijs, 1983, Fisika Bangunan, Jakarta Pusat: ERLANGGA
5. Freick Heinz, 1980, Ilmu Konstruksi Bangunan , Yogyakarta : Erlangga.
6. Puspantoro Beni IGN, 1984, Konstruksi Bangunan Gedung, Yogyakarta: Andi Offset.
7. Direktorat PSMK, 2009, Spektrum SMK , Jakarta : Depdiknas.
8. Hadi Suyono. 2014, Perancangan Instalasi Listrik Pada Blok Pasar Modern dan Apartemen di Gedung Kawasan Pasar Teroadu Blimbing Malang . Malang: Unibraw

**Supporters:**

**Supporting lecturer** Arik Triarso, S.Pd., M.T.  
Feriza Nadiar, S.T., M.T.  
Siti Talitha Rachma, S.T., M.Sc.

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 can explain and understand the basics of building installations	<p><b>Criteria:</b> Students are active in asking questions and holding discussions.</p> <p><b>Form of Assessment :</b> Participatory Activities</p>		Lectures, discussions and questions and answers - Discuss and understand the basics of building installations based on learning resource number 2. 2 X 50 Minutes	<p><b>Material:</b> Basics of Building Installation</p> <p><b>Library:</b> Poerbo, Hartono, 2002, Utility Buildings, Jakarta : Djangkat.</p>	5%
2	Students understand advanced material about the basics of building installations (DETERMINATION OF INSTALLATION NETWORKS)	Students can explain and understand the basics of building installations (DETERMINATION OF INSTALLATION NETWORKS)	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Added value for students who are active in asking questions and holding discussions.</li> <li>2. Full marks are obtained if you do all the quiz questions correctly</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>		Lecture. Discussion and Q&A 2 X 50 Minutes	<p><b>Material:</b> Determining the installation network.</p> <p><b>Bibliography:</b> Puspantoro Beni IGN, 1984, Building Construction, Yogyakarta: Andi Offset.</p>	5%
3	Students understand about planning hot water supply systems and SPAM (continued)	Students are able to explain the planning of hot water supply systems and SPAM (continued)	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1. Added value for students who are active in asking questions and holding discussions.</li> <li>2. Full marks are obtained if you do all the quiz questions correctly</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Lecture. Discussion and Q&A 2 x 50 minutes		<p><b>Material:</b> cold/hot water supply system planning and SPAM (continued)</p> <p><b>Reference:</b> Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</p>	5%
4	Students can understand the design of electrical installation systems	Students are able to explain the design of electrical installation systems (continued)	<p><b>Criteria:</b> Full marks are obtained if you do all the quiz questions correctly</p> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	lectures, discussions, questions and answers, and case studies 2 x 50 minutes		<p><b>Material:</b> Electrical installation system design</p> <p><b>Reference:</b> Maryono, 2009, Basic Electrical Installation Module, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</p>	5%

5	Students can understand the design of electrical installation systems (continued)	Students are able to explain the design of electrical installation systems (continued)	<p><b>Criteria:</b> Full marks are obtained if you can analyze and solve the case study correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	lectures, discussions, questions and answers, and case studies 2 x 50 minutes		<p><b>Material:</b> electrical installation system design (continued)</p> <p><b>Reference:</b> <i>Hadi Suyono. 2014, Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang. Malang: Unibraw</i></p>	5%
6	Students understand the design of the Electric Light Point Grouping system	Students are able to explain the design of electrical installation systems (continued)	<p><b>Criteria:</b> Full marks are obtained if you can analyze and solve the case study correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	lectures, discussions, questions and answers, and case studies 2 x 50 minutes		<p><b>Material:</b> Design of an Electric Light Point Grouping system</p> <p><b>Reader:</b> <i>Hadi Suyono. 2014, Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang. Malang: Unibraw</i></p>	5%
7	Students understand waste water (dirty water) and vent network planning systems	Students are able to explain the planning system for waste water (sewage) and vent networks	<p><b>Criteria:</b> Full marks are obtained if you can analyze and solve the case study correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	lectures, discussions, questions and answers, and case studies 2 x 50 minutes		<p><b>Material:</b> waste water (sewage) and vent network planning.</p> <p><b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p>	5%
8	MIDTERM EXAM	<ol style="list-style-type: none"> <li>1. Students understand the basics of building installation</li> <li>2. Students understand the hot water supply system and SPAM</li> <li>3. Students understand the design of electrical installation systems</li> <li>4. Students understand wastewater and vent network planning systems</li> </ol>	<p><b>Criteria:</b> -</p> <p><b>Form of Assessment :</b> Test</p>	- 2 X 50			15%
9	Students understand and understand the rainwater drainage system	Students are able to explain the rainwater drainage system	<p><b>Criteria:</b> According to the group presentation rubric</p>	Presentation and group discussion 2 X 50 minutes		<p><b>Material:</b> Rainwater drain components</p> <p><b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and</i></p>	5%

Maintenance,  
PT. Pradnya  
Paramitha:  
Center for  
Public  
Communication.

**Material:** Types  
of rainwater  
drainage

**Reference:**  
Soufyan Moh.  
Noerbambang  
and Takeo  
Morimura, 2005,  
Plumbing  
System Design  
and  
Maintenance,  
PT. Pradnya  
Paramitha:  
Center for  
Public  
Communication.

**Material:**  
Vertical pipe  
sizes

**Reference:**  
Soufyan Moh.  
Noerbambang  
and Takeo  
Morimura, 2005,  
Plumbing  
System Design  
and  
Maintenance,  
PT. Pradnya  
Paramitha:  
Center for  
Public  
Communication.

**Material:**  
rainwater  
drainage

**Reference:**  
Soufyan Moh.  
Noerbambang  
and Takeo  
Morimura, 2005,  
Plumbing  
System Design  
and  
Maintenance,  
PT. Pradnya  
Paramitha:  
Center for  
Public  
Communication.

**Material:** Size  
of horizontal  
rainwater  
drainage pipes

**Reference:**  
Soufyan Moh.  
Noerbambang  
and Takeo  
Morimura, 2005,  
Plumbing  
System Design  
and  
Maintenance,  
PT. Pradnya  
Paramitha:  
Center for  
Public  
Communication.

**Material:**  
Standard sizes  
of vertical and  
horizontal pipes  
for rainwater  
drainage.

**Reference:**  
Soufyan Moh.  
Noerbambang  
and Takeo  
Morimura, 2005,  
Plumbing  
System Design  
and  
Maintenance,  
PT. Pradnya

						<p><i>Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Types of gutters and their functions <b>Reference:</b> Soufyan Moh. Noerbambang and Takeo Morimura, 2005, <i>Plumbing System Design and Maintenance</i>, PT. Pradnya Paramitha: Center for Public Communication.</p> <hr/> <p><b>Material:</b> Gutter planning (examples of measurements and installation) <b>Reference:</b> Soufyan Moh. Noerbambang and Takeo Morimura, 2005, <i>Plumbing System Design and Maintenance</i>, PT. Pradnya Paramitha: Center for Public Communication.</p> <hr/> <p><b>Material:</b> Control body and functions along with planning. <b>Reader:</b> Soufyan Moh. Noerbambang and Takeo Morimura, 2005, <i>Plumbing System Design and Maintenance</i>, PT. Pradnya Paramitha: Center for Public Communication.</p>
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10	Students understand about AC (air conditioner) system planning	Students are able to explain and classify AC (air conditioner) systems	<p><b>Criteria:</b> Full marks are obtained if you do all the questions correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Lecture. Discussion and Q&A 2 x 50 minutes		<p><b>Material:</b> Working principles of AC <b>Reference:</b> Maryono, 2009, <i>Basic Electrical Installation Module</i>, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</p> <hr/> <p><b>Material:</b> AC supporting equipment <b>Reference:</b> Maryono, 2009, <i>Basic Electrical Installation Module</i>, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</p> <hr/> <p><b>Material:</b> AC Circuits <b>Reference:</b> Maryono, 2009, <i>Basic Electrical Installation Module</i>, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</p> <hr/> <p><b>Material:</b> AC Capacity <b>Reader:</b> Hadi Suyono. 2014, <i>Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang.</i> Malang: Unibraw</p> <hr/> <p><b>Material:</b> AC calculations <b>Reader:</b> Hadi Suyono. 2014, <i>Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang.</i> Malang: Unibraw</p>	5%
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11	Students understand Vertical Transportation Planning	Students are able to explain and classify Vertical Transportation planning	<p><b>Criteria:</b> According to the group presentation rubric</p> <p><b>Form of Assessment :</b> Participatory Activities, Practice/Performance</p>	Presentation and group discussion 2 X 50		<p><b>Material:</b> Elevators and Escalators <b>Literature:</b> <i>Puspantoro Beni IGN, 1984, Building Construction, Yogyakarta: Andi Offset.</i></p> <hr/> <p><b>Material:</b> Calculation of lift capabilities, zones and carrying capacity <b>Reader:</b> <i>Hadi Suyono. 2014, Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang. Malang: Unibraw</i></p>	5%
12	Students understand the hot water supply system	Students are able to explain the hot water supply system	<p><b>Criteria:</b> Full marks are obtained if you do all the questions correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Lecture. Discussion and Questions and Answers 2 X 50		<p><b>Material:</b> Hot water supply system <b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Classification of hot water supply systems <b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Water heating system <b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p>	5%

13	Students understand the hot water supply system	Students are able to explain the hot water supply system (continued)	<p><b>Criteria:</b> Full marks are obtained if you do all the questions correctly</p> <p><b>Form of Assessment :</b> Participatory Activities, Tests</p>	Lecture. Discussion and Questions and Answers 2 X 50		<p><b>Material:</b> Calculation of hot water temperature and mixing percentage</p> <p><b>Reference:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Calculation of hot water flow rate (table explanation, example questions and exercises); a. Calculations based on the number of users. b. Calculations based on the type and number of plumbing equipment.</p> <p><b>Reader:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Planning and calculating heating capacity.</p> <p><b>References:</b> <i>Maryono, 2009, Basic Electrical Installation Module, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</i></p>	5%
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14	Students know and understand about preventing and dealing with fire hazards	Students are able to explain the design of a fire prevention and control system	<p><b>Criteria:</b> According to the group presentation rubric</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Lecture. Discussion and Questions and Answers 2 X 50		<p><b>Material:</b> Prevention and control of fire hazards <b>Reader:</b> <i>Soufyan Moh. Noerbambang and Takeo Morimura, 2005, Plumbing System Design and Maintenance, PT. Pradnya Paramitha: Center for Public Communication.</i></p> <hr/> <p><b>Material:</b> Hydrants, sprinklers, danger alarms, gathering points, location plans, fire extinguishers and emergency stairs <b>Reader:</b> <i>Hadi Suyono. 2014, Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang. Malang: Unibraw</i></p> <hr/> <p><b>Material:</b> Hydrants, sprinklers, danger alarms, gathering points, location plans, fire extinguishers and emergency stairs. <b>Reference:</b> <i>Maryono, 2009, Basic Electrical Installation Module, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223</i></p>	5%
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15	Students understand about lightning protection installation	Students can learn about the design of lightning protection installation systems	<b>Criteria:</b> According to the group presentation rubric  <b>Form of Assessment :</b> Participatory Activities	Presentation and group discussion 2 X 50		<b>Material:</b> Process of lightning and types of lightning <b>Reference:</b> Ing PJ M van der Meijs, 1983, Building Physics, Central Jakarta: ERLANGGA <hr/> <b>Material:</b> Definition of lightning rod <b>Reference:</b> Ing PJ M van der Meijs, 1983, Building Physics, Central Jakarta: ERLANGGA <hr/> <b>Material:</b> General criteria for lightning protection <b>Reader:</b> Hadi Suyono. 2014, Design of Electrical Installations in the Modern Market Block and Apartments in the Teroadu Market Area Building, Blimbing Malang. Malang: Unibraw <hr/> <b>Material:</b> Parts of the lightning protection system and their functions and factors that influence them; Planning for installing a lightning protection system <b>Reference:</b> Maryono, 2009, Basic Electrical Installation Module, SMK NEGERI 3 YOGYAKARTA Jl. RW Monginsidi No 2 Yogyakarta 55223	5%
16	Final exams		<b>Form of Assessment :</b> Test	2 X 50 minutes			20%

#### Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	37.5%
2.	Project Results Assessment / Product Assessment	12.5%
3.	Practice / Performance	2.5%
4.	Test	47.5%
		100%

#### 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.