



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

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																
Power plant	99992040102031		T=2	P=0	ECTS=3.18	3	July 17, 2024																																
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																	
	Ayusta Lukita Wardani, S.ST., M.T.		Widi Aribowo, S.T., M.T			Mahendra Widayartono, S.T., M.T.																																	
Learning model	Project Based Learning																																						
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																						
	PLO-5	Skilled in the application of science and technology in the fields of design, maintenance systems and electrical power engineering to produce prototypes, standard procedures and/or designs as well as compiling the results of the study in the form of working papers, term papers, posters and so on.																																					
	PLO-6	Able to identify, formulate, search for references or standards, analyze and solve problems in energy conversion work and generation systems as well as utilization of low voltage and medium voltage electric power using analytical tools for the field of electric power engineering technology.																																					
	Program Objectives (PO)																																						
	PLO-PO Matrix																																						
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 100px;">P.O</td> <td style="width: 100px;">PLO-5</td> <td style="width: 100px;">PLO-6</td> <td colspan="4"></td> </tr> </table>						P.O	PLO-5	PLO-6																													
P.O	PLO-5	PLO-6																																					
PO Matrix at the end of each learning stage (Sub-PO)																																							
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td rowspan="2" style="width: 50px;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;">2</td> <td style="width: 20px;">3</td> <td style="width: 20px;">4</td> <td style="width: 20px;">5</td> <td style="width: 20px;">6</td> <td style="width: 20px;">7</td> <td style="width: 20px;">8</td> <td style="width: 20px;">9</td> <td style="width: 20px;">10</td> <td style="width: 20px;">11</td> <td style="width: 20px;">12</td> <td style="width: 20px;">13</td> <td style="width: 20px;">14</td> <td style="width: 20px;">15</td> <td style="width: 20px;">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	Introduction, Natural Energy that can be converted into electrical energy, Energy Conversion, Energy problems and development strategies in Indonesia, Hydroelectric Power Plants, Components or equipment from hydroelectric power plants, Types of Thermal Power Plants, Components and equipment from Thermal Power Plants, Types of renewable power plants, problems with power plants																																						
References	Main :																																						
	1. Arismunandar, Artono. 1975. Buku pegangan Teknik tenaga listrik Jilid 1. Jakarta: Pradya Paramita 2. Marsudi, Djiteng. 2005. Pembangkitan energi listrik. Jakarta Erlangga 3. Archi, W. 1985. Prinsip-prinsip konversi energi. Jakarta erlangga																																						
	Supporters:																																						
Supporting lecturer	Widi Aribowo, S.T., M.T. Ayusta Lukita Wardani, S.ST., M.T.																																						
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 basic knowledge regarding electrical energy generation	1.Explain the basic knowledge of electric power generation 2.Explain the types of electric power plants	Criteria: 1.The assessment criteria are carried out by looking at aspects: 2. Form of Assessment : Participatory Activities	Presentation, group discussion and reflection 2 X 50	Presentation, group discussion and reflection 2 X 50		2%																																

2	Able to understand knowledge about electrical installations from power generation centers	Explain knowledge of electrical installations from hydro and thermal power generation centers	<p>Criteria:</p> <ol style="list-style-type: none"> The assessment criteria are carried out by looking at aspects: Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Presentation, group discussion and reflection 2 X 50	Presentation, group discussion and reflection 2 X 50		2%
3	Able to understand knowledge about the working principles of hydroelectric power plants	<ol style="list-style-type: none"> Explain the basic knowledge of the working principles of hydroelectric power plants Explain the components of a hydroelectric power plant 	<p>Criteria:</p> <ol style="list-style-type: none"> The assessment criteria are carried out by looking at aspects: Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Presentation, group discussion and reflection 2 X 50	Presentation, group discussion and reflection 2 X 50		2%
4	Able to understand basic knowledge regarding the working principles of coal-fired steam power plants	Explain the basic knowledge and working principles of coal-fired steam power plants	<p>Criteria:</p> <ol style="list-style-type: none"> The assessment criteria are carried out by looking at aspects: Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Presentation, group discussion and reflection 2 X 50	Presentation, group discussion and reflection 2 X 50		2%

5	Able to understand the components of a coal-fired steam power plant	Explain the knowledge of the components of a coal-fired steam power plant	Criteria: 1.The assessment criteria are carried out by looking at aspects: 2.Participation: carried out by observing student activities (weight 2) UTS: carried out with assessments during the middle of the semester (weight 2) UAS: carried out every semester to measure all indicators (weight 3) Assignments: carried out on each indicator (weight 3) Value Student End: 3.Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10.	Presentation, group discussion and reflection 2 X 50	Presentation, group discussion and reflection 2 X 50		2%
6	UTS	product	Form of Assessment : Project Results Assessment / Product Assessment	2 X 50			30%
7	Students are able to understand the types of coal-fired thermal plants (PLTU).	1. Explain the components and equipment in coal-fired thermal plants2. Explain the working principles of coal power plants	Criteria: 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight) 3.2.UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. Form of Assessment : Test	Discussion, exercises, assignments and presentations 2 X 50	Discussion, exercises, assignments and presentations 2 X 50		5%
8	Students are able to understand the types of coal-fired thermal plants (PLTU).	1.1. Explain the components and equipment in coal-fired thermal plants 2.2. Explain the working principles of coal power plants	Criteria: 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight) 3.2.UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. Form of Assessment : Test	Discussion, exercises, assignments and presentations 2 X 50	Discussion, exercises, assignments and presentations 2 X 50		5%

9	Students are able to explain the components of an oil-fired steam power plant and students are able to explain the working principles of an oil-fired steam power plant	<ol style="list-style-type: none"> 1.Explain the components and equipment of oil-fired thermal plants 2.Explain the working principle of an oil power plant 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Discussion, exercises and assignments 2 X 50	Discussion, exercises and assignments 2 X 50		2%
10	Students are able to explain the components of an oil-fired steam power plant and students are able to explain the working principles of an oil-fired steam power plant	<ol style="list-style-type: none"> 1.Explain the components and equipment of oil-fired thermal plants 2.Explain the working principle of an oil power plant 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. 	Discussion, practice 2 X 50	Discussion, practice 2 X 50		2%
11	Students are able to explain the components of gas power plants and gas and steam power plants (PLTU and PLTGU). Students are able to explain the working principles and process of producing electrical energy from gas-fired power plants (PLTG). Students are able to explain the working principles and process of producing electrical energy from gas and steam-powered power plants (PLTGU)/Combined Cycle	<ol style="list-style-type: none"> 1.Explain the components and equipment of gas-fired Gas Power Plants (PLTG). 2.Explain the components and equipment of a Gas and Steam Power Plant (PLTGU)/Combined Cycle Plant fueled by steam gas 3.Explain the working principles of gas power plants and the working principles of steam gas power plants 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Test</p>	Discussion of Exercises and Assignments 2 X 50	Discussion of Exercises and Assignments 2 X 50		5%

12	<p>Students are able to explain the components of gas power plants and gas and steam power plants (PLTU and PLTGU). Students are able to explain the working principles and process of producing electrical energy from gas-fired power plants (PLTG). Students are able to explain the working principles and process of producing electrical energy from gas and steam-powered power plants (PLTGU)/Combined Cycle</p>	<ol style="list-style-type: none"> 1.Explain the components and equipment of gas-fired Gas Power Plants (PLTG). 2.Explain the components and equipment of a Gas and Steam Power Plant (PLTGU)/Combined Cycle Plant fueled by steam gas 3.Explain the working principles of gas power plants and the working principles of steam gas power plants 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Test</p>	Discussion and test 2 X 50	Discussion and test 2 X 50		8%
13	<p>Students are able to explain the components of gas power plants and gas and steam power plants (PLTU and PLTGU). Students are able to explain the working principles and process of producing electrical energy from gas-fired power plants (PLTG). Students are able to explain the working principles and process of producing electrical energy from gas and steam-powered power plants (PLTGU)/Combined Cycle</p>	<ol style="list-style-type: none"> 1.Explain the components and equipment of gas-fired Gas Power Plants (PLTG). 2.Explain the components and equipment of a Gas and Steam Power Plant (PLTGU)/Combined Cycle Plant fueled by steam gas 3.Explain the working principles of gas power plants and the working principles of steam gas power plants 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Discussion of Exercises and Assignments 2 X 50	Discussion of Exercises and Assignments 2 X 50		2%
14	<p>Students are able to explain the working principles and components of renewable generators.</p>	<ol style="list-style-type: none"> 1.Explain the components and equipment of renewable generators 2.explain the working principles of renewable generators 	<p>Criteria:</p> <ol style="list-style-type: none"> 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. 	material and discussion 2 X 50	material and discussion 2 X 50		2%

15	Students are able to understand the problems of interference and frequency regulation of electric power plants	Explain the problems faced by generators, namely interference and frequency regulation	Criteria: 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10.	Discussion, exercises and assignments 2 X 50	Discussion, exercises and assignments 2 X 50		2%
16	UAS	UAS	Criteria: 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Lever Score (3) x UTS Score (2) x UAS Score (3) divided by 10. Form of Assessment : Project Results Assessment / Product Assessment	2 X 50			35%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	10%
2.	Project Results Assessment / Product Assessment	67%
3.	Test	23%
		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.

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.