	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
Electrical Power Engineering	2120102091		T=2	P=0	ECTS=3.18	5	July 16, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Ir. Priyo Heru Adiwibowo, S.T., M.T.

Learning model	**Project Based Learning**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PO - 1: Students can understand the terms electricity, electrical resistance, power work and electrical power, efficiency or efficiency, accumulators, Kirchhoff's second law, electric charge
	PLO-PO Matrix

P.O
PO-1

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																

Short Course Description	Understanding the study of the use of electrical terms, electrical resistance, power work and electrical power, usability or efficiency, accumulators, Kirchhoff's second law, electric charge, electric power generation systems, the concept of electromagnetic induction, various types of AC/DC electric motors, AC/DC generators , transformer.
References	**Main :**

1. Suryatmo .F,Dasar-Dasar Teknik Listrik, Rineka Cipta, Jakarta, 1992.Berahim, Hamzah,Teknik Tenaga Listrik Dasar, Jakarta, Graha Ilmu, 2011.Bird, J. O. and A. J. C. May,1989,Electrical and ElectronicPrinciples 3 Checkbook 2nd ed.,BH Newnes: Oxford.Bird, J. O., 2014,Electrical and Electronic Principles andTechnology 5th ed., Routledge: London.Robertson, C. R., 2008,Fundamental Electrical and Electronic Principles3rd ed., Elsevier.
2. Berahim, Hamzah, Teknik Tenaga Listrik Dasar, Jakarta, Graha Ilmu, 2011
3. Bird, J. O. and A. J. C. May,1989, Electrical and ElectronicPrinciples 3 Checkbook 2nd ed.,BH Newnes: Oxford
4. Bird, J. O., 2014, Electrical and Electronic Principles andTechnology 5th ed., Routledge: London.
5. Robertson, C. R., 2008, Fundamental Electrical and Electronic Principles3rd ed., Elsevier.

Supporters:

1. Modul Teknik Tenaga listrik
2. Materi PPT

Supporting lecturer	Dr. Aris Ansori, S.Pd., 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	Be able to compare the characteristics of types of electric current	Students can explain the types of electric current and their characteristics	**Criteria:** can compare the types of electric current characteristics correctly **Form of Assessment** : Participatory Activities	lectures and discussions 2 X 50			5%
2	Analyzing electric power systems, including generation, transmission and distribution systems of electrical energy	1. Students can analyze systems and distribution of electrical energy 2. Students can determine the components of electrical energy generation, transmission and distribution systems	**Criteria:** can determine the components of electrical energy generation, transmission and distribution systems correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			6%
3	Able to install 1 phase and 3 phase electrical systems	1. Students can install a 1 phase electrical system 2. Students can install 3 phase electrical systems	**Criteria:** 1. Can assemble 1 phase electrical installations correctly 2. Can assemble 3 phase electrical installations correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			4%
4	Understand the working principles of 1 phase and 3 phase transformers	Students can explain the working principle of a transformer	**Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			5%
5	Skilled in testing the performance of 1 phase and 3 phase transformers	Students can test the performance of 1 phase and 3 phase transformers	**Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			5%

6	1. Analyze the DC generator system and determine its components 2. able to calculate and analyze the work of DC generators	1. Students can explain the working principles of DC generators and their components 2. Students can determine the components of a DC generator according to their type 3. Students can calculate and analyze the work of DC generators according to their type	**Criteria:** 1. can explain the working system of a DC generator correctly 2. can determine the DC generator components according to the type correctly 3. can calculate and analyze the work of DC generators according to their type correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			5%
7	1. Analyze a single phase AC generator system and determine its components 2. able to calculate and analyze the work of a single phase AC generator	1. Students can explain the working principles of AC generators and their components 2. Students can calculate and analyze the work of a single phase AC generator	**Criteria:** 1. can explain the working system of a single phase AC generator correctly 2. can determine the components of a 1 fae AC generator according to their type correctly 3. can calculate and analyze the work of a single phase AC generator according to its type correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			5%
8	1. Analyze a 3 phase AC generator system and determine its components 2. able to calculate and analyze the work of a 3 phase AC generator	1. Students can explain the working principle of a 3-phase AC generator and its components 2. students can calculate and analyze the work of a 3 phase AC generator	**Criteria:** 1. Can explain the working system of a 3 phase AC generator correctly 2. can determine the AC3 phase generator components according to their type correctly 3. can calculate and analyze the work of a 3 phase AC generator according to its type correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			5%
9	Skilled in measuring DC generator performance with loading	Students can measure the performance of DC generators with loading	**Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			0%

10	Skilled in measuring and analyzing synchronous generator performance	students can carry out measurements of synchronous generators	**Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			5%
11	Skilled in measuring and analyzing the performance of Asynchronous generators	students can carry out measurements of asynchronous generators	**Criteria:** can carry out measurements of Asynchronous generators correctly **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			5%
12	1. Understand the principles of DC electric motors and their components 2. Analyze the workings of DC electric motors according to their type	1. Students can understand the principles of DC motors and their components 2. students can analyze the performance of DC electric motors	**Criteria:** 1. can explain how a DC motor and its components work correctly 2. can analyze the performance of DC electric motors correctly **Form of Assessment** : Test	Lectures, discussions and questions and answers 2 X 50			5%
13	1. Students can understand how a single-phase AC synchronous electric motor works and determine its components based on type 2. Students can analyze and evaluate the performance of single-phase AC synchronous electric motors based on their type	1. can understand how a single-phase AC synchronous electric motor works and determine its components based on type 2. can analyze and evaluate the performance of single-phase AC synchronous electric motors based on their type	**Criteria:** 1. can explain the work of a single-phase AC synchronous electric motor and determine its components based on type correctly 2. can analyze and evaluate the performance of single-phase AC synchronous electric motors based on their type correctly **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			5%
14	1. Students can understand how a 3-phase AC synchronous electric motor works and determine its components based on type 2. Students can analyze and evaluate the performance of 3-phase AC synchronous electric motors based on their type	1. can understand how a three-phase AC synchronous electric motor works and determine its components based on type 2. can analyze and evaluate the performance of 3-phase AC synchronous electric motors based on their type	**Criteria:** 1. can explain the work of a 3-phase AC synchronous electric motor and determine its components based on type correctly 2. can analyze and evaluate the performance of 3-phase AC synchronous electric motors based on their type correctly **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and practicum 2 X 50			5%

15	1.Understanding power electronic systems in electrical engineering 2.students can design power electronics systems for electrical power control applications	1.can explain power electronic systems in electrical engineering 2.can design power electronics systems for electrical power control applications	**Criteria:** 1.can design power electronic systems for electrical power control applications correctly 2.can design power electronic systems for electrical power control applications correctly **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50			5%
16	1.Able to solve problems related to the application of electrical machines in industry 2.students can design a parallel circuit of two generators and analyze their performance	1.can solve problems related to the application of electrical machines in industry 2.can design a parallel circuit of two generators and analyze their performance	**Criteria:** 1.can design a parallel circuit of two generators and analyze their performance correctly 2.can design a parallel circuit of two generators and analyze their performance correctly **Form of Assessment** : Project Results Assessment / Product Assessment				20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	65%
2.	Project Results Assessment / Product Assessment	20%
3.	Test	5%
		90%

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.