	Universitas Negeri Surabaya Vocational Faculty, D4 Electrical Engineering Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Pract. AC Electrical Machines	2030502037		T=2	P=0	ECTS=3.18	4	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Mahendra Widyartono, 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)
	PLO-PO Matrix

P.O

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

Short Course Description	Students demonstrate basic knowledge of induced emf, voltage regulation, characteristics, losses and efficiency as well as operation of synchronous generators and synchronous motors in the field. Demonstrate theoretical concepts of DC motors, synchronous motors and asynchronous motors, working principles, construction, types, characteristics and efficiency. Planning a solution approach to the problem of selecting and using synchronous motors, asynchronous motors and synchronous generators in the field. Equipping students with professional skills to operate synchronous and asynchronous machines in accordance with predetermined operating standards and procedures.
References	**Main :**

1. Chapman, S.J. 2004. Electric Machinery Fundamentals FourthEdition. McGraw-Hill, Inc.
2. Djoko Archyanto. 1990. Mesin-Mesin Listrik. Jakarta: Erlangga.
3. Fitzgerald A.E., Kingsley Jr. C, Umans, S.D. 1990. Mesin-Mesin Listrik Edisi Keempat. Jakarta: Penerbit Erlangga.
4. Joko, 2014. Lembar Eksperimen Sheet (LES). Surabaya, JTE FT Unesa
5. Kadir A. 1999. Mesin Sinkron. Jakarta: Djambatan.
6. Mislan. 1991. Mesin Tak Serempak. Surabaya: University Press IKIP Surabaya.
7. M.V. Deshpande, 1990. Electric Motors: Aplications and Control. Vinayok Cotlagre Shivajinagar, Y. P Chopra.
8. Supari Muslim, 2008. Pembangkitan Tenaga Listrik. Jakarta, BNSP Depdiknas.
9. T.M. Sulaiman, M. Magarisawa. 1984. Mesin Tak Serempak Dalam Praktek. Jakarta: Pradnya Paramita.

Supporters:	
Supporting lecturer	Mahendra Widyartono, S.T., 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 carry out preparatory work, testing DC generator characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a DC generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

2	Able to carry out preparatory work, testing DC generator characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a DC generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

3	Able to carry out preparatory work, testing DC generator characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a DC generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

4	Able to carry out preparatory work, testing DC motor characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of DC motors 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

5	Able to carry out preparatory work, testing DC motor characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of DC motors 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

6	Able to carry out preparatory work, testing DC motor characteristics and reporting the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of DC motors 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

7	Able to carry out preparatory work, test the characteristics of a single phase synchronous generator and report the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a single phase synchronous generator 2. Formulate goals 3. Formulate variables and operational definitions of variables 4. Compile a brief relevant theory 5. Create a test suite image 6. Formulate a hypothesis 7. Create a test plan 8. Create a data table design for test results 9. Conduct experiments 10. Collect data on test results 11. Create a data table of test results 12. Create graphs based on test results 13. Carry out interpretation of test result data 14. Analyze test result data 15. Concluding the results of test data analysis 16. Make follow-up decisions on test results 17. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPractice AssignmentsReflection 6 X 50			0%

8	Able to carry out preparatory work, test the characteristics of a single phase synchronous generator and report the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a single phase synchronous generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 6 X 50			0%

9	Able to carry out preparatory work, test the characteristics of a 3 phase synchronous generator and report the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a 3 phase synchronous generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 2 X 50			0%

10	Able to carry out preparatory work, test the characteristics of a 3 phase synchronous generator and report the results	1. Formulate the title of the experiment (testing) characteristics (zero load, load, regulator, external and short circuit) of a 3 phase synchronous generator 2. Formulate the problem 3. Formulate goals 4. Formulate variables and operational definitions of variables 5. Compile a brief relevant theory 6. Create a test suite image 7. Formulate a hypothesis 8. Create a test plan 9. Create a data table design for test results 10. Conduct experiments 11. Collect data on test results 12. Create a data table of test results 13. Create graphs based on test results 14. Carry out interpretation of test result data 15. Analyze test result data 16. Concluding the results of test data analysis 17. Make follow-up decisions on test results 18. Report test results	**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 2 X 50			0%
11	Able to carry out preparatory work, test the characteristics of a 3 phase asynchronous motor, and report the results		**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 2 X 50			0%

12	Able to carry out preparatory work, test the characteristics of a 3 phase asynchronous motor, and report the results		**Criteria:** 1. The cognitive domain consists of 16 items and the max score for each item is 4, so the total max. 64 2. The psychomotor domain consists of 8 items and the maximum score for each item is 3, so the total is max. 24 3. The affective domain consists of 10 items and the max score for each item is 1.2, so the total is max. 12 **Form of Assessment** : Participatory Activities	Discovery learningPresentationDiscussionQuestions and answersPracticeAssignmentsReflection 2 X 50			0%
13			**Form of Assessment** : Participatory Activities				0%
14			**Form of Assessment** : Participatory Activities				0%
15			**Form of Assessment** : Participatory Activities				0%
16				-	-		0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

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.