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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Alternating Current Machine	8320103068		T=3	P=0	ECTS=4.77	5	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Nur Kholis, S.T., M.T.

Learning model	**Case Studies**
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 have knowledge about synchronous generators, including: definition, working principles, types, parts, armature windings and calculations of quantities, characteristics of synchronous generators. Have knowledge of synchronous and asynchronous motors, including: definition, working principles, types, principles & methods of starting and braking, reversing direction of rotation, regulation of rotation speed, characteristics (rotation characteristics, torque characteristics, mechanical characteristics) anchor reactions, losses and yields (efficiency), and slip. Students have the ability and responsible attitude to design and select synchronous generators, synchronous and asynchronous motors according to load characteristics and general electrical installation regulations (PUIL).6. Understand AC Power, Generator and Gen Set maintenance management
References	**Main :**

1. Djoko Achyanto, 1990. Mesin-Mesin Listrik. Jakarta : Erlangga.
2. Joko, 2013. Bahan Ajar Mesin Arus Bolak Balik. Jurusan Teknik Elektro Fakultas Teknik Unesa Surabaya
3. Mislan. 1991. Mesin Tak Serempak. Surabaya: University Press IKIP Surabaya
4. O&rsquoKelly, Denis. 1992. Performance and Control of Electrical Machines. London: McGraw-Hill
5. Supar M. Dkk. 2009. Pembangkinan Tenaga Listrik. BSE, BNSP depdikas, Jakarta
6. Ts. Mhd. Sulaiman, Mabuchi Magarisawa. 1984. Mesin Tak Serempak Dalam Praktek. Jakarta: Pradya Paramita

Supporters:	
Supporting lecturer	Dr. Ir. Achmad Imam Agung, M.Pd. 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	Students have knowledge about synchronous generators, including: understanding synchronous generators, working principles of synchronous generators, types of synchronous generators, parts of synchronous generators and their functions, armature windings and calculating their quantities, characteristics of synchronous generators (zero load, loaded, regulating, external and short circuit) losses, generator efficiency, and voltage regulation and line work	1. Be able to explain the relationship between magnetic fields and electric fields 2. Be able to explain how energy is stored in a magnetic field	**Criteria:** The score is 1 to 4	1. MPL2. 9 X 50 Cooperative Model			0%
2	Students have knowledge about synchronous generators, including: understanding synchronous generators, working principles of synchronous generators, types of synchronous generators, parts of synchronous generators and their functions, armature windings and calculating their quantities, characteristics of synchronous generators (zero load, loaded, regulating, external and short circuit) losses, generator efficiency, and voltage regulation and line work	1. Be able to explain the relationship between magnetic fields and electric fields 2. Be able to explain how energy is stored in a magnetic field	**Criteria:** The score is 1 to 4	1. MPL2. 9 X 50 Cooperative Model			0%
3	Students have knowledge about synchronous generators, including: understanding synchronous generators, working principles of synchronous generators, types of synchronous generators, parts of synchronous generators and their functions, armature windings and calculating their quantities, characteristics of synchronous generators (zero load, loaded, regulating, external and short circuit) losses, generator efficiency, and voltage regulation and line work	1. Be able to explain the relationship between magnetic fields and electric fields 2. Be able to explain how energy is stored in a magnetic field	**Criteria:** The score is 1 to 4	1. MPL2. 9 X 50 Cooperative Model			0%
4	Understand the basics of electromechanics	1. Be able to explain the emergence of electromotive force 2. Be able to explain the coupling of forces in simple electrical machines.	**Criteria:** 1. 1-4 score assessment	1. Cooperative Model 6 X 50			0%

5	Understand the basics of electromechanics	1. Be able to explain the emergence of electromotive force 2. Be able to explain the coupling of forces in simple electrical machines.	**Criteria:** 1. 1-4 score assessment	1. Cooperative Model 6 X 50			0%
6	Understanding Induction Motors	.1. Explain the working principle of an induction motor.2. Explain the equivalent circuit of an induction motor.3. Explain power and torque.4. Explain the types of induction motors.5. Explain the working principle of an induction generator6. Explains the rotation settings	**Criteria:** 1. 1-4 score assessment	1. MPBM 6 X 50			0%
7	Understanding Induction Motors	.1. Explain the working principle of an induction motor.2. Explain the equivalent circuit of an induction motor.3. Explain power and torque.4. Explain the types of induction motors.5. Explain the working principle of an induction generator6. Explains the rotation settings	**Criteria:** 1. 1-4 score assessment	1. MPBM 6 X 50			0%
8	1. UTS2. Understanding Synchronous Motors	1. Explain the working principle of a synchronous machine. 2. Explain vector diagrams 3. Explain voltage regulation. 4. Explain the parallel work of synchronous machines. 5. Explain current, power and synchronization torque. 6. Explain synchronous motors. 7. Explain the power angle of a synchronous machine. 8. Explain the working principle of a synchronous condenser	**Criteria:** score 1 - 4	Lectures, discussions, questions and answers 9 X 50			0%

9	Understanding Synchronous Motors	1. Explain the working principle of a synchronous machine. 2. Explain vector diagrams 3. Explain voltage regulation. 4. Explain the parallel work of synchronous machines. 5. Explain current, power and synchronization torque. 6. Explain synchronous motors. 7. Explain the power angle of a synchronous machine. 8. Explain the working principle of a synchronous condenser	**Criteria:** score 1 - 4	Lectures, discussions, questions and answers 9 X 50			0%
10	Understanding Synchronous Motors	1. Explain the working principle of a synchronous machine. 2. Explain vector diagrams 3. Explain voltage regulation. 4. Explain the parallel work of synchronous machines. 5. Explain current, power and synchronization torque. 6. Explain synchronous motors. 7. Explain the power angle of a synchronous machine. 8. Explain the working principle of a synchronous condenser	**Criteria:** score 1 - 4	Lectures, discussions, questions and answers 9 X 50			0%
11	Understanding Synchronous Motors and Their Applications	1. Explain power and torque. 2. Explain the types of induction motors. 3. Explain the working principle of an induction generator. 4. Explain the rotation settings.	**Criteria:** Assessment score 1 - 4	Lectures, Discussions, case studies 9 X 50			0%
12	Understanding Synchronous Motors and Their Applications	1. Explain power and torque. 2. Explain the types of induction motors. 3. Explain the working principle of an induction generator. 4. Explain the rotation settings.	**Criteria:** Assessment score 1 - 4	Lectures, Discussions, case studies 9 X 50			0%

13	Understanding Synchronous Motors and Their Applications	1. Explain power and torque. 2. Explain the types of induction motors. 3. Explain the working principle of an induction generator. 4. Explain the rotation settings.	**Criteria:** Assessment score 1 - 4	Lectures, Discussions, case studies 9 X 50			0%
14	1. Understand the Application of Synchronous Motors2. UAS	1. Explain voltage regulation. 2. Explain the parallel work of synchronous machines. 3. lighting in electric power systems 4. Weaknesses and advantages of synchronous motors 5. UAS	**Criteria:** score for each variable 1 - 4	Lectures, Discussions, 3 X 50			0%
15	1. Understand the Application of Synchronous Motors2. UAS	1. Explain voltage regulation. 2. Explain the parallel work of synchronous machines. 3. lighting in electric power systems 4. Weaknesses and advantages of synchronous motors 5. UAS	**Criteria:** score for each variable 1 - 4	Lectures, Discussions, 3 X 50			0%
16	1. Understand the Application of Synchronous Motors2. UAS	1. Explain voltage regulation. 2. Explain the parallel work of synchronous machines. 3. lighting in electric power systems 4. Weaknesses and advantages of synchronous motors 5. UAS	**Criteria:** score for each variable 1 - 4	Lectures, Discussions, 3 X 50			0%

Evaluation Percentage Recap: Case Study

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.