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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Transient Stability For Multi Machines	2020102059	Compulsory Study Program Subjects	**T=2**	**P=0**	**ECTS=3.18**	5	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Dr. Ir. Achmad Imam Agung, M.Pd. ; Dr. Subuh Isnur Haryudo, S.T., M.T. ; Fendi Achmad, S.Pd., M.Pd.	Prof. Dr. Bambang Suprianto, M.T.	Dr. Lusia Rakhmawati, 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	Able to apply knowledge of mathematics, natural sciences, information technology, and electrical engineering to gain a thorough understanding of engineering principles

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	Power system stability and mathematical models, system response to small disturbances, synchronous machines, synchronous machine simulation, excitation systems, influence of excitation on stability, systems with compound machines.

References

Main :

1. William D. Stevenson Jr. 1990. Element of Power System Analisys 4 th Edition . NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analisys . NY: McGraw-Hill, Inc. Gross, A. Charles. (1990). Power System Analisys , New York: John Wiley & Sons. Andreas, P.M., Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability , Vol. I, II.

Supporters:

1. A. Charles. (1990). Power System Analisys , New York: John Wiley & Sons.

Supporting lecturer	Dr. Ir. Achmad Imam Agung, M.Pd. Dr. Subuh Isnur Haryudo, 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	Can study and analyze a system's response to disturbances such as loss of generation	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

2	Can study and analyze a system's response to disturbances such as loss of generation	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
3	Can explain line-switching operations, faults and sudden load changes in the first few seconds after a fault	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

4	Can explain line-switching operations, faults and sudden load changes in the first few seconds after a fault	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
5	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

6	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
7	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

8	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
9	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

10	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc.* *Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc.* *Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability* *Kimbark, Power System Stability , Vol. III.* *Crary, Power System Stability, Vol. I, II.*	5%
11	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc.* *Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc.* *Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability* *Kimbark, Power System Stability , Vol. III.* *Crary, Power System Stability, Vol. I, II.*	5%

12	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
13	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

14	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%
15	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

16	Can determine whether the machine or system will return to synchronous frequency after a disturbance occurs	Evaluation Rubric	**Criteria:** Evaluation Rubric **Form of Assessment** : Participatory Activities	Contextual Instruction 2 x 50		**Material:** Meeting material 1 **Reader:** *William D. Stevenson Jr. 1990. Elements of Power System Analysis 4th Edition. NY: McGraw-Hill, Inc. Moh. El-Hawary. Electrical Power Systems Design and Analysis. NY: McGraw-Hill, Inc. Gross, Andreas, PM, Fouad, A,A ., Power System Control and Stability Kimbark, Power System Stability , Vol. III. Crary, Power System Stability, Vol. I, II.*	5%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	80%
		80%

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.