UNESA	**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
Advanced Electrical Circuits	8320102237		T=2	P=0	ECTS=3.18	2	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Nur Kholis, 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	Providing understanding, application and evaluation of circuit parameters, basic alternating current circuits, resonance, alternating current power, mesh network analysis, node voltage network analysis, network analysis, mutual induction and multi-phase systems
References	**Main :**

1. Edminister. 1972. Electrical Circuits. Schaum Serie. Outline. New York: Mc.Graw-Hill Book Company.
2. Munoto. 2008. Analisis Rangkaian Listrik AC. Surabaya: Unesa University Press
3. Munoto. 2014. Ringkasan Teori dan pemecahan soal-soal Rangkaian Listrik AC 1. Surabaya: Unesa University Press

Supporters:

Supporting lecturer	Dr. Nur Kholis, S.T., M.T. Yulia Fransisca, S.Pd., M.Pd. Roswina Dianawati, S.Pd., M.Ed. Sayyidul Aulia Alamsyah, 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 are able to understand and analyze the meaning of alternating current, elements of alternating current, average price and effective price, vector diagrams, phase differences, skin effect, proximity effect, and complex numbers	- Explain the meaning of alternating current, average value and alternating current - Explain the forms of complex numbers - Carry out arithmetic operations on complex numbers	**Criteria:** assessment of assignments regarding the correctness of answers and timeliness of submission	Presentation, &ampampnbspgroup discussion and reflection 4 X 50			0%

2	Students are able to understand and analyze the meaning of alternating current, elements of alternating current, average price and effective price, vector diagrams, phase differences, skin effect, proximity effect, and complex numbers	- Explain the meaning of alternating current, average value and alternating current - Explain the forms of complex numbers - Carry out arithmetic operations on complex numbers	**Criteria:** assessment of assignments regarding the correctness of answers and timeliness of submission	Presentation, &ampampnbspgroup discussion and reflection 4 X 50			0%
3	Students are able to understand the concepts of impedance and admittance and can analyze series, parallel and mixed circuits for alternating current electricity	- Explain the concept of impedance and admittance - Calculate phase differences in R, L and C series circuits - Investigate phase differences in circuits with R load, L load and C load - Investigate phase differences in R, L and C series circuits Validate electrical circuit theories R, L, C through practical activities	**Criteria:** correct work and accuracy in completing assignments	Presentation, group discussion and reflection 4 X 50			0%
4	Students are able to understand the concepts of impedance and admittance and can analyze series, parallel and mixed circuits for alternating current electricity	- Explain the concept of impedance and admittance - Calculate phase differences in R, L and C series circuits - Investigate phase differences in circuits with R load, L load and C load - Investigate phase differences in R, L and C series circuits Validate electrical circuit theories R, L, C through practical activities	**Criteria:** correct work and accuracy in completing assignments	Presentation, group discussion and reflection 4 X 50			0%
5	Students are able to understand the concepts of impedance and admittance and can analyze series, parallel and mixed circuits for alternating current electricity	- Explain the concept of impedance and admittance - Calculate phase differences in R, L and C series circuits - Investigate phase differences in circuits with R load, L load and C load - Investigate phase differences in R, L and C series circuits Validate electrical circuit theories R, L, C through practical activities	**Criteria:** correct work and accuracy in completing assignments	Presentation, group discussion and reflection 4 X 50			0%
6	1. Students can explain and analyze Impedance and Admittance 2. Students can explain and analyze Impedance Z	Ability to explain and analyze impedance in series circuits	**Form of Assessment** : Participatory Activities	Problem-based learning, lectures and discussions			0%

7	Students can analyze and evaluate work power, apparent power, reactive power, power triangle, power complex, and work factor improvements in alternating current electrical circuits	- Explaining working power, apparent power and reactive power - Calculating the values of working power, apparent power and reactive power - Calculating work factor improvements Validating the theory of alternating current electrical power through practical activities	**Criteria:** completion of assignments and accuracy of assignment collection	Discussion, assignments and exercises 2 X 50			0%
8	See meetings 1 to 7	see meeting indicators 1 - 7	**Criteria:** the number of questions done correctly	Midterm exam 2 X 50			0%
9	Students are able to determine mesh currents and the number of mesh currents, mesh equations, analyze circuits using matrices, and analyze circuits through driving points and impedance transfer	- Determine the number of mesh currents - Analyze the circuit using a matrix - Analyze the circuit through driving points and impedance transfer Validate Mesh current network analysis theories through practical work in the laboratory	**Criteria:** Correct work and accuracy in completing assignments	Discussions, assignments and exercises 2 X 50			0%
10	Students are able to determine node voltage and number of node voltages, node voltage equations, analyze and evaluate circuits using matrices, and analyze circuits through driving points and transfer admittance.	- determine node voltage and number of node voltage, node voltage equation, - analyze the circuit using a matrix, - analyze/evaluate the circuit through driving points and transfer admittance Validate node voltage theories through practical work in the laboratory	**Criteria:** correct work, and accuracy in completing assignments	Discussion, assignments and exercises 2 X 50			0%

11	Students can analyze and evaluate electrical circuits using the theories of Thevenin&rsquos, Norton&rsquos, Triangle-Star Transformation, Superposition, Reciprocity, Parallel Series Equivalent Circuits, Compensation, Matching (maximum power transfer), and filters in analyzing circuits	- analyze and evaluate electrical circuits using Thevenin‘s theories, - analyze and evaluate electrical circuits using Norton‘s theories, - analyze and evaluate electrical circuits using the Triangle-Star Transformation, - analyze and evaluate electrical circuits using Superposition, - analyze and evaluate electrical circuits using Reciprocity theory, - analyze and evaluate electrical circuits using Parallel Series Equivalent Circuits, - analyze and evaluate electrical circuits using Compensation theory, - analyze and evaluate electrical circuits using Matching theory (maximum power transfer), and - analyzing and evaluating electrical circuits using bridge and filter circuits can validate network analysis theories through practical work in the lab	**Criteria:** accuracy of collection and correctness of work	discussion, assignments and exercises 4 X 50			0%
12	Students can analyze and evaluate electrical circuits using the theories of Thevenin&rsquos, Norton&rsquos, Triangle-Star Transformation, Superposition, Reciprocity, Parallel Series Equivalent Circuits, Compensation, Matching (maximum power transfer), and filters in analyzing circuits	- analyze and evaluate electrical circuits using Thevenin‘s theories, - analyze and evaluate electrical circuits using Norton‘s theories, - analyze and evaluate electrical circuits using the Triangle-Star Transformation, - analyze and evaluate electrical circuits using Superposition, - analyze and evaluate electrical circuits using Reciprocity theory, - analyze and evaluate electrical circuits using Parallel Series Equivalent Circuits, - analyze and evaluate electrical circuits using Compensation theory, - analyze and evaluate electrical circuits using Matching theory (maximum power transfer), and - analyzing and evaluating electrical circuits using bridge and filter circuits can validate network analysis theories through practical work in the lab	**Criteria:** accuracy of collection and correctness of work	discussion, assignments and exercises 4 X 50			0%

13	Students can analyze and evaluate electrical circuits using the theories of Thevenin&rsquos, Norton&rsquos, Triangle-Star Transformation, Superposition, Reciprocity, Parallel Series Equivalent Circuits, Compensation, Matching (maximum power transfer), and filters in analyzing circuits	- Can calculate mutual induction in circuit analysis. - Can calculate the coupling coefficient in circuit analysis. - Explain natural currents - Explain the dot rule - Explain magnetic coupled equivalent circuits and direct coupled circuits in circuit analysis. Can validate theories of mutual induction through practical work in the lab	**Criteria:** accuracy of work and collection of assignments	Discussion, practice and reflection 2 X 50			0%
14	Able to understand, apply, analyze and synthesize problems related to two phase systems, three phase systems and symmetrical three phase load voltage systems, one line equivalent circuits, asymmetrical triangular loads, four wire asymmetrical star loads, asymmetrical star loads 3 wire, displacement neutral method, power on 3 wire loads, wattmeter on 4 wire systems, two wattmeter method and 2 wattmeter method for symmetrical loads	understand, problems related to two phase systems, - analyze problems related to three phase systems and symmetric three phase load voltage systems, - analyze circuits using the neutral displacement method for asymmetric star systems, 3 wires - analyze circuits using two watt meter method for symmetrical loads. Can validate multiple phase system theories through practical work in the lab	**Criteria:** correctness of work and timeliness of assignment submission	Discussion, exercises and assignments 6 X 50			0%
15	Able to understand, apply, analyze and synthesize problems related to two phase systems, three phase systems and symmetrical three phase load voltage systems, one line equivalent circuits, asymmetrical triangular loads, four wire asymmetrical star loads, asymmetrical star loads 3 wire, displacement neutral method, power on 3 wire loads, wattmeter on 4 wire systems, two wattmeter method and 2 wattmeter method for symmetrical loads	understand, problems related to two phase systems, - analyze problems related to three phase systems and symmetric three phase load voltage systems, - analyze circuits using the neutral displacement method for asymmetric star systems, 3 wires - analyze circuits using two watt meter method for symmetrical loads. Can validate multiple phase system theories through practical work in the lab	**Criteria:** correctness of work and timeliness of assignment submission	Discussion, exercises and assignments 6 X 50			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.