	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
Electronics Project	2020102323		T=0	P=0	ECTS=0	5	July 18, 2024
AUTHORIZATION	**SP Developer**		**Course Cluster Coordinator**			**Study Program Coordinator**	
	....		....			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)
	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

This course is a project-based course which aims to apply electronic components into a system that can be used by electronics laboratories. This course includes analysis of components, sensors and transducers; and design, creation and evaluation of systems. The system can be a monitoring system, a measurement system or a control system. The data access point used can be WSN, WEB or IoT.

References

Main :

1. Buctami Achir. 1985. Perencanaan Kebutuhan Fasilitas Pelajaran Praktek dan Optimasi Pemakaiannya. Bandung: P3GT Depdik. bud. Kavanaugh.
2. William A. 1982. Consideration. When Planning Electricity Electronic Shop, in Modern School Shop Planning. Michigan: Praken Publications, Inc.
3. Strom, George. 1979. Managing the Occupational Edlucation Laboratory. Michigan: Praken Publication, Inc..
4. Hayt, WH. & Kimmerly. 1978. Engineering Circut Analysis. Singapore: McGraw-Hill Book Co.
5. Theraja, BL. 1979. Electric Technology. New Delhi: S. Chand & Company, Ltd.
6. Paul, Clayton R. 1989. Analysis of Linear Circuits. New york: McGraw- Hill.
7. Hayt, WH. & Kimmerly. 1978. Engineering Circut Analysis. Singapore: McGraw-Hill Book Co.
8. Edminister. 1972. Electrical Cicuits, Schaum Series Outline. New York: McGraw-Hill Book Company.
9. Paul, Clayton R. 1989. Analysis of Linear Circuits. New york: McGraw- Hill.
10. Albert D. Helfrick. 1990. Modern Electronic Instrumentation and Measurement Thecniques.
11. J.B. Gupta. 1979. Electrical Measurements and Measuring Instruments.
12. Soedjana Sapiie. 1979. Pengukuran dan Alat Ukur Listrik.
13. Tech. M. 1979. Electrical Measurements and Measuring Instruments India: Khanna Publisher.
14. Molville, B. Stout. 1981. Basic Electrical Measurement. New Delhi: Prelitice-Hall.
15. Soewarsono. 1992. Pengukuran Listrik. Surabaya: University Press IKIP Surabaya. A.P.
16. Malvino. 1993. Electronic Principle . Singapore: McGraw-Hill.
17. Schultz, M.E. 1994. Electronics Devices . Singapore: Glencoe.
18. Cooper, William D. 1991. Electronic Instrumentation and Measurement Techniques . USA: Prentice-Hill.
19. Helfrick, Albert D. and Cops William D. 1990. Modern Electronic Instrumentation and Measurement Technique . USA; Prentice-Hall.

Supporters:

Supporting lecturer

Prof. Dr. Bambang Suprianto, M.T.
L. Endah Cahya Ningrum, S.Pd., M.Pd.

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 can carry out analysis on components, sensors and transducers.	1. Perform analysis on temperature sensors 2. Carry out analysis of sensors related to water	**Criteria:** 1. Score 1, if the student can explain very incompletely about sensors and their types as well as their specifications and applications. 2. Score 2, if the student can explain incompletely about sensors and their types as well as their specifications and applications. 3. Score 3, if the student can explain in full about sensors and their types as well as their specifications and applications. 4. Score 4, if the student can explain quite completely about sensors and their types as well as their specifications and applications. 5. Score 5, if the student can explain very completely about sensors and their types as well as their specifications and applications.	Learning approach: Concept Learning method: Student Centered Learning Learning model/strategy: Inquiry Learning 3 X 50			0%

2	Students can carry out analysis on components, sensors and transducers.	1. Carry out analysis of distance sensors and object detectors 2. Perform analysis on sound sensors	**Criteria:** 1. Score 1, if the student can explain very incompletely about sensors and their types as well as their specifications and applications. 2. Score 2, if the student can explain incompletely about sensors and their types as well as their specifications and applications. 3. Score 3, if the student can explain in full about sensors and their types as well as their specifications and applications. 4. Score 4, if the student can explain quite completely about sensors and their types as well as their specifications and applications. 5. Score 5, if the student can explain very completely about sensors and their types as well as their specifications and applications.	Learning approach: Concept Learning method: Student Centered Learning Learning model/strategy: Inquiry Learning 3 X 50			0%

3	Understand and apply the basic laws of electricity and basic theory of electrical circuits	1. Explain direct current (DC) generation 2. Explain the types of direct current 3. Explain Faraday's law 4. Explain Kirchhoff's law 19s 5. Explain Ohm's law 6. Explain Lenz's law 7. Calculate the branch voltage across some resistance 8. Calculate the equivalent resistance in a series circuit. 9. Calculating equivalent resistance in parallel circuits. 10. Calculating the branch current in a two-branch parallel circuit. 11. Calculating equivalent resistance in series-parallel (mixed) circuits 12. Calculate the magnitude of the conductance G 13. Skilled in carrying out practical work in the laboratory to validate series, parallel and mixed connections.	**Criteria:** test score: number of correct answers x 100, divided by the number of test items	Discussion, giving examples of R circuit problems and assignments in theory class, Practical validation of 4 X 50 series, parallel and mixed R circuits			0%

4	Understand and apply the basic laws of electricity and basic theory of electrical circuits	1.Explain direct current (DC) generation 2.Explain the types of direct current 3.Explain Faraday's law 4.Explain Kirchhoff's law 19s 5.Explain Ohm's law 6.Explain Lenz's law 7.Calculate the branch voltage across some resistance 8.Calculate the equivalent resistance in a series circuit. 9.Calculating equivalent resistance in parallel circuits. 10.Calculating the branch current in a two-branch parallel circuit. 11.Calculating equivalent resistance in series-parallel (mixed) circuits 12.Calculate the magnitude of the conductance G 13.Skilled in carrying out practical work in the laboratory to validate series, parallel and mixed connections.	**Criteria:** test score: number of correct answers x 100, divided by the number of test items	Discussion, giving examples of R circuit problems and assignments in theory class, Practical validation of 4 X 50 series, parallel and mixed R circuits			0%
5	Can analyze and evaluate the concept of direct current electric power, and practice in the laboratory	1. Calculate the amount of DC2 electrical power. calculate DC3 electrical work. calculate DC4 electric heat. Skilled in carrying out practical work in the laboratory to validate electrical power.	**Criteria:** The test score is obtained by: number of correct answers x 100 then divided by the number of test items	Discussion, providing examples of electrical power problems and assignments in theory class. Practical validation of the R 2 X 50 circuit			0%

6	1. Able to use the mesh current method to solve problems in complex direct current circuits 2. Skilled in validating the theory of the mesh current method in the laboratory	1. Calculating the number of mesh currents, 2. Determines the direction of the mesh current, 3. Write down the mesh current equation 4. Calculate the magnitude of each mesh current using elimination 5. Calculate the magnitude of each mesh current using a matrix. 6. Calculate the amount of current, voltage, or resistance in the mesh using driving point resistance 7. Calculate the amount of current, voltage, or resistance in the mesh using transfer resistance 8. Skilled in validating the mesh flow method through practical work in the laboratory	**Criteria:** The score obtained by students is the number of correct answers x 100 divided by the number of test items	Discussion, providing examples of solving complex electrical circuits using the mesh current method and assignments in theory classes. Practical validation of the 4 X 50 mesh flow method			0%

7	1. Able to use the mesh current method to solve problems in complex direct current circuits 2. Skilled in validating the theory of the mesh current method in the laboratory	1. Calculating the number of mesh currents, 2. Determines the direction of the mesh current, 3. Write down the mesh current equation 4. Calculate the magnitude of each mesh current using elimination 5. Calculate the magnitude of each mesh current using a matrix. 6. Calculate the amount of current, voltage, or resistance in the mesh using driving point resistance 7. Calculate the amount of current, voltage, or resistance in the mesh using transfer resistance 8. Skilled in validating the mesh flow method through practical work in the laboratory	**Criteria:** The score obtained by students is the number of correct answers x 100 divided by the number of test items	Discussion, providing examples of solving complex electrical circuits using the mesh current method and assignments in theory classes. Practical validation of the 4 X 50 mesh flow method			0%
8	Explore meetings 3 to 7 regarding basic electrical circuits, electric power, and mesh current methods	1. Correctly solve basic electrical circuit problems 2. Correctly solve DC electrical power problems 3. Correctly solve DC electrical circuit problems using the mesh current method. 4. Skilled in carrying out practical work to validate theory	**Criteria:** There isn‘t any	Practice solving basic electrical circuit problems, electrical power, and 2 X 50 mesh current			0%
9	MIDDLE EXAMINATION See meetings 1 to 8	See meetings 1 to 8	**Criteria:** The score is obtained by: the number of items answered is multiplied by 100 then divided by the number of test items.	2 X 50 exam			0%

10	Able to use the node voltage method to solve problems in complex direct current circuits	1. Counting the number of vertices, 2. Write down the equation of the vertex 3. Calculate the magnitude of the voltage at each node using the node equation by elimination. 4. Calculate the magnitude of the voltage at each node using the node equation in matrix form. 5. Calculate the magnitude of current, voltage, conductance or resistance at node points using driving point conductance 6. Calculate the amount of current, conductance, or resistance at a node using the node equation in the form of transfer resistance 7. Skilled in validating the node stress method through practical work in the laboratory	**Criteria:** The test score is obtained by: the number of test items answered correctly x 100 then divided by the number of test items	Discussion, providing examples of solving complex electrical circuits using the nodal voltage method and assignments in theory class. Practical validation of the 4 X 50 nodal voltage method			0%

11	Able to use the node voltage method to solve problems in complex direct current circuits	1. Counting the number of vertices, 2. Write down the equation of the vertex 3. Calculate the magnitude of the voltage at each node using the node equation by elimination. 4. Calculate the magnitude of the voltage at each node using the node equation in matrix form. 5. Calculate the magnitude of current, voltage, conductance or resistance at node points using driving point conductance 6. Calculate the amount of current, conductance, or resistance at a node using the node equation in the form of transfer resistance 7. Skilled in validating the node stress method through practical work in the laboratory	**Criteria:** The test score is obtained by: the number of test items answered correctly x 100 then divided by the number of test items	Discussion, providing examples of solving complex electrical circuits using the nodal voltage method and assignments in theory class. Practical validation of the 2 X 50 nodal voltage method			0%

12	Able to use impedance network analysis solving methods to solve problems in direct current electrical circuits	1. Calculating the equivalent resistance for the Thevenins and Norton circuits, 2. Calculate the open circuit voltage (Voc) for the Thevenins circuit. 3. Calculate the short circuit current (Isc) for the Norton circuit, 4. Establish the Thevenins and Nortons equivalent circuits 5. Understand the triangle-star transformation equation 6. Determine the magnitude of the impedance of the star from the triangular connection 7. Determine the magnitude of the triangle impedance of the star connection. 8. Calculating the amount of electricity from a source that works alone 9. Calculating the amount of electricity caused by several sources working simultaneously 10. Proving the reciprocity theory 11. Proving the compensation theory 12. Calculating series-parallel equivalent circuits 13. Determine matching requirements 14. Calculate the maximum power transfer 15. Skilled in validating resistance network theory through practical work in the laboratory	**Criteria:** The test score is obtained by: the number of test items answered correctly x 100 then divided by the total number of test items	Discussion, providing examples of solving complex electrical circuits using the R network analysis method, and assignments in theory classes. Practical validation of several R 2 X 50 network analyzes			0%
13				3 X 50			0%

14	Able to use impedance network analysis solving methods to solve problems in direct current electrical circuits	1. Calculating the equivalent resistance for the Thevenins and Norton circuits, 2. Calculate the open circuit voltage (Voc) for the Thevenins circuit. 3. Calculate the short circuit current (Isc) for the Norton circuit, 4. Establish the Thevenins and Nortons equivalent circuits 5. Understand the triangle-star transformation equation 6. Determine the magnitude of the impedance of the star from the triangular connection 7. Determine the magnitude of the triangle impedance of the star connection. 8. Calculating the amount of electricity from a source that works alone 9. Calculating the amount of electricity caused by several sources working simultaneously 10. Proving the reciprocity theory 11. Proving the compensation theory 12. Calculating series-parallel equivalent circuits 13. Determine matching requirements 14. Calculate the maximum power transfer 15. Skilled in validating resistance network theory through practical work in the laboratory	**Criteria:** The test score is obtained by: the number of test items answered correctly x 100 then divided by the total number of test items	Discussion, providing examples of solving complex electrical circuits using the R network analysis method, and assignments in theory classes. Practical validation of several R 2 X 50 network analyzes			0%

15	Explore meetings 10 to 14 regarding the node voltage method and R resistance network	1. Correctly solve circuit problems using the node voltage method 2. Correctly solving DC electrical circuit problems through analysis of the R resistance network 3. Skilled in carrying out practicums to validate theories	**Criteria:** calculate the rational amount of activity	Training in solving mesh flow method problems and R 2 X 50 network analysis			0%
16	FINAL EXAMS	See meetings 1 through 15	**Criteria:** See meetings 1 through 15	2 X 50 test exam			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.