	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. Power Electronics	2030502038		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	Characteristics of Power Electronics components (Diode, Thyriston, DIAC, TRIAC, UJT, FET, Electronic switch analysis, Pulse generator circuit analysis. Rectifier uses diodes for one phase and three phases, Rectifier uses SCR for one phase and three phases. Single phase inverter, three phase inverter phase; Use of electronic circuits to regulate electrical machines
References	**Main :**

1. Pustaka Utama : Rashid, Muhammad H. 2004. Power Electronics: Circuits, Devices, and Applications, 3 ND. ED. Prentice Hall Inc. New Jersey.
2. R. W. Erickson, 1997, Fundamentals of Power Electronics
3. Pustaka Penunjang : Sen, P. C. 1990. Power Electronics. Tata McGraw Hill- Publishing Company Limited. New Delhi.
4. Singh,MD. (1998). Power Electronics, New Delhi, Tata McGraw Hill- Publishing Company Limited.

	Supporters:
Supporting lecturer	Widi Aribowo, S.T., M.T. Nur Vidia Laksmi B., S.ST, M.Sc.

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 understand and explain the introduction to power electronics and can simulate single-phase halfwave uncontrolled rectifiers	1. Accuracy in defining Power Electronics Practical 2. Students understand the circuit and characteristics of a single-phase halfwave uncontrolled rectifier 3. Students are able to create a single-phase halfwave uncontrolled rectifier circuit on the simulator 4. Students understand the input voltage and current output of a single-phase halfwave uncontrolled rectifier circuit with load variations 5. Students are able to analyze single-phase halfwave uncontrolled rectifier circuits	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			3%
2	Students understand, explain and simulate single-phase full-wave uncontrolled rectifiers	1. Students understand the circuit and characteristics of a single-phase full-wave uncontrolled rectifier 2. Students are able to create a single-phase full-wave uncontrolled rectifier circuit on the simulator 3. Students understand the input voltage and current output of a single-phase full-wave uncontrolled rectifier circuit with load variations 4. Students are able to analyze single-phase halfwave uncontrolled rectifier circuits	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			3%

3	Students understand, explain and simulate three-phase half and full-wave uncontrolled rectifiers	1. Students understand the circuit and characteristics of three-phase half and full wave uncontrolled rectifiers 2. Students are able to make three-phase half and full wave uncontrolled rectifier circuits on the simulator 3. Students understand the input voltage and output current of three-phase half and full wave uncontrolled rectifier circuits with load variations 4. Students are able to analyze three-phase half and full wave uncontrolled rectifier circuits	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			3%
4	Students understand, explain and simulate single-phase half-wave controlled rectifiers	1. Students understand the circuit and characteristics of a single-phase half-wave controlled rectifier 2. Students are able to create a single-phase half-wave controlled rectifier circuit on the simulator 3. Students understand the input voltage and current output of a single-phase half-wave controlled rectifier circuit with variations in switching components 4. Students are able to analyze single-phase half-wave controlled rectifier circuits	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			4%

5	Students understand, explain and simulate single-phase full-wave controlled rectifiers	1. Students understand the circuit and characteristics of a single-phase full-wave controlled rectifier 2. Students are able to create a single-phase full-wave controlled rectifier circuit on the simulator 3. Students understand the input voltage and current output of a single-phase full-wave controlled rectifier circuit with a variety of switching components 4. Students are able to analyze single-phase full-wave controlled rectifier circuits	**Form of Assessment** : Participatory Activities, Practice/Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			4%
6	Students understand, explain and simulate three-phase half-wave controlled rectifiers	1. Students understand the circuit and characteristics of a three-phase half-wave controlled rectifier 2. Students are able to make a three-phase half-wave controlled rectifier circuit on the simulator 3. Students understand the input voltage and current output of a three-phase half-wave controlled rectifier circuit with variations in switching components 4. Students are able to analyze three-phase half-wave controlled rectifier circuits	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			4%

7	Students understand, explain and simulate three-phase full-wave controlled rectifiers	1. Students understand the circuit and characteristics of a three-phase full-wave controlled rectifier 2. Students are able to create a three-phase full-wave controlled rectifier circuit on the simulator 3. Students understand the input voltage and current output of a three-phase full-wave controlled rectifier circuit with variations in switching components 4. Students are able to analyze three-phase full-wave controlled rectifier circuits	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	□ Lectures □ Brainstorming, □ group discussions [TM: 2%2 (3x50")] Task 1: Literature Review Carrying out a resume from the literature review [BT BM:4 x (3x50")] 4 X 50			4%
8	Sub Summative Evaluation (UTS): To determine the competency achievements of the Power Electronics Practicum course	Midterm exam	**Forms of Assessment** : Project Results Assessment / Product Assessment, Portfolio Assessment, Practice / Performance	2 X 50			20%
9	Final ability: Students are able to understand and explain the 3 PHASE SEMI CONTROLLED REVIEWER	1. Students are skilled at assembling semi-controlled three-phase rectifiers 2. Students can understand the characteristics of a semi-controlled three-phase rectifier with various load variations 3. Students can describe the current and voltage waveforms of a semi-controlled three-phase rectifier at various load variations	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance	Lecture Group discussion Presentation [TM: 2%2 (3x50")] Task 5: Literature Review Carrying out a resume from the literature review Practicing questions [BT BM:4 x (3x50")] 4 X 50			3%

10	Final ability: Students are able to understand and explain the 3 PHASE SEMI CONTROLLED REVIEWER II	1. Students are skilled at assembling semi-controlled three-phase rectifiers 2. Students can understand the characteristics of a semi-controlled three-phase rectifier with various load variations 3. Students can describe the current and voltage waveforms of a semi-controlled three-phase rectifier at various load variations	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	Lecture Group discussion Presentation [TM: 2%2 (3x50")] Task 5: Literature Review Carrying out a resume from the literature review Practicing questions [BT BM:4 x (3x50")] 4 X 50			3%
11	Final ability: Students are able to understand and explain about HALF-WAVE CONTROLLED 3-PHASE RECIRECTIVE	1. Students are skilled at assembling controlled three-phase half-wave rectifiers 2. Students can understand the characteristics of a controlled three-phase half-wave rectifier with various load variations 3. Students can describe the current and voltage waveforms of a controlled three-phase half-wave rectifier at various load variations	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance	Lecture Group discussion Presentation [TM: 2%2 (3x50")] Task 6: Literature Review Carrying out a resume from the literature review Practicing questions [BT BM:4%2 (3x50")] Developing a model with Matlab simulink [PS BM: (2 2)x (3x50")] 4 X 50			3%
12	Final ability: Students are able to understand and explain about HALF-WAVE CONTROLLED 3-PHASE RECIRECTIVE	1. Students are skilled at assembling a controlled three-phase half-wave rectifier using an SCR 2. Students can understand the characteristics of a controlled three-phase half-wave rectifier with various load variations 3. Students can describe the current and voltage waveforms of a controlled three-phase half-wave rectifier at various load variations	**Form of Assessment** : Participatory Activities, Portfolio Assessment	Lecture Group discussion Presentation [TM: 2%2 (3x50")] Task 6: Literature Review Carrying out a resume from the literature review Practicing questions [BT BM:4%2 (3x50")] Developing a model with Matlab simulink [PS BM: (2 2)x (3x50")] 4 X 50			4%

13	Students are able to present about power supply applications, motor drive applications, applications	□ Sharpness in differentiating power supply, motor drive, residential and industrial applications □ Ability to simulate, industrial applications	**Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment	Lecture Group discussion Each group examines a certain theme Presentation and discussion [TM: 2%2 (3x50")] Preparing papers and presentation slides [BT BM: 4%2 (3x50")] 4 X 50			4%
14	Students are able to present about power supply applications, motor drive applications, applications	□ Sharpness in differentiating power supply, motor drive, residential and industrial applications □ Ability to simulate, industrial applications	**Form of Assessment** : Participatory Activities, Portfolio Assessment	Lecture Group discussion Each group examines a certain theme Presentation and discussion [TM: 2%2 (3x50")] Preparing papers and presentation slides [BT BM: 4%2 (3x50")] 4 X 50			4%
15	Students are able to present about power supply applications, motor drive applications, applications	□ Sharpness in differentiating power supply, motor drive, residential and industrial applications □ Ability to simulate, industrial applications	**Form of Assessment** : Participatory Activities, Portfolio Assessment	Lecture Group discussion Each group examines a certain theme Presentation and discussion [TM: 2%2 (3x50")] Preparing papers and presentation slides [BT BM: 4%2 (3x50")] 4 X 50			4%
16	Summative Evaluation: To determine the achievement of competency in the Power Electronics course [1%2 (2%2 50")]	Final exams	**Form of Assessment** : Assessment of Project Results / Product Assessment, Practices / Performance				30%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	17.99%
2.	Project Results Assessment / Product Assessment	21.67%
3.	Portfolio Assessment	18%
4.	Practical Assessment	9.99%
5.	Practice / Performance	32.33%
		99.98%

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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.