	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
Electrical Machines	2020102410	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	5	August 7, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Prof. Dr. Joko, M.Pd. MT.	Prof. Dr. Joko, M.Pd. MT.	Dr. Lusia Rakhmawati, S.T., M.T.

Learning model	**Case Studies**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PO - 1: Have comprehensive skills regarding DC generators/motors, generators/motors, both synchronous and asynchronous, 1 phase/3 phase, which include: understanding, working principles and functions; parts and their functions; winding ; magnitude; characteristics; losses and efficiency, generator voltage regulation, and electric motor slip.
	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	This course provides the ability to understand DC generators, DC motors, Synchronous Generators, Induction Generators, Synchronous Motors, Asynchronous Motors, and single-phase motors, including: definition, working principles, parts and functions, windings, basic quantities, characteristics, losses, efficiency, including generator voltage regulation and slip in induction motors. This course also provides students with experience, knowledge, skills and attitudes in working together to solve actual daily problems related to generators and electric motors in accordance with applicable rules and regulations.
References	**Main :**

1. Stephen J. Chapman, 2012. Electric Machinary Fundamentals Fifth Edition. MCGraw-Hill: New York
2. Joko, 2018. Mesin Arus Bolak Balik. University Press: Surabaya
3. Joko, 2016. Mesin Arus Searah. University Press: Surabaya

Supporters:

1. Joko, 2021. Exsperiment Sheet Generator DC. Jurusan Teknik Elektro Fakultas Teknik Unesa Surabaya
2. Joko, 2021. Exsperiment Sheet Generator DC. Jurusan Teknik Elektro Fakultas Teknik Unesa Surabaya

Supporting lecturer	Prof. Dr. Joko, M.Pd., 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	Identify, compare and analyze sources of information to draw conclusions about the differences between DC generators and DC motors in terms of their meaning, working principles and functions	1. Analyze and conclude the differences between generators and DC motors in terms of understanding 2. Analyze and conclude the differences between generators and DC motors in terms of working principles 3. Analyze and conclude the differences between generators and DC motors in terms of their functions 4. Participative	**Criteria:** 1. Accuracy of analyzing and concluding the differences between generators and DC motors in terms of understanding, max score 30 2. Accuracy of analyzing and concluding the differences between generators and DC motors in terms of working principles, max score 38 3. Accuracy of analyzing and concluding the differences between generators and DC motors in terms of their functions, max score 30 4. Participative, max score 2 **Form of Assessment** : Participatory Activities		Case Studies. Given everyday equipment problems, students explore information sources - digital books and discussions to identify, identify and analyze to conclude the differences between DC generators and DC motors in terms of their meaning, working principles and functions 100 minutes	**Material:** Definition, working principles and functions of direct current (DC) generators and direct current (DC) motors. **Reference:** *Stephen J. Chapman, 2012. Electric Machine Fundamentals Fifth Edition. MCGraw-Hill: New York*	3%
2	Identify, interpret, and analyze data and information to conclude the types and notation systems of DC generators and DC motors	1. The process of carrying out identification 2. Perform data analysis 3. Make conclusions about types and notation systems 4. Participative	**Criteria:** 1. Accuracy of the identification process, max score 15 2. Process accuracy and data correctness, max score 15 3. Accuracy of data interpretation, max score 15 4. Accuracy of data analysis, max score 20 5. Correct conclusion of type and notation complete with image, max score 31 6. Participative, max score 4 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case studies. Given a generator and DC motor problem, students search for sources of information and identify the type of generator and DC motor notation directly in the laboratory in groups. 60 minutes	Case studies. Based on the data obtained from the identification of types and notation systems, students held discussions to analyze and conclude the types and notation systems of generators and DC motors. 40 minutes	**Material:** Types of DC generators and motors and their notations **Reference:** *Joko, 2016. Direct Current Machines. University Press: Surabaya*	3%
3	Identify, interpret data, and analyze data and information to conclude the differences/parts of DC generators and DC motors and their functions	1. Participative 2. Identification process and results 3. Interpreting data 4. Analysis results 5. Detailed summary of the parts and their functions	**Criteria:** 1. Participative, max score 2 2. Accuracy of identification process and results, max score 15 3. Accuracy of data interpretation, max score 15 4. Accuracy of analysis results, max score 15 5. Accuracy of detailed conclusions about parts and their functions, max score 15 6. Students can make details of the parts of a DC generator/motor and their respective functions. correctly, max score 38 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case studies. Identify and make detailed drawings of generator and DC motor parts in the 60 minute laboratory	Case studies. Students explore sources of information and discuss detailed pictures of the parts and functions of DC generators and motors, interpret data, analyze and conclude 40 minutes	**Material:** Parts of DC generators and DC motors and their functions **Reference:** *Joko, 2016. Direct Current Machines. University Press: Surabaya*	3%

4	Carry out calculations of quantities on DC generators and DC motors	1. Calculates the voltage of DC generator (GDC) and DC motor (MDC) shunt, series, compound, and separate amplifier GDC 2. Calculate GDC and MDC voltage losses of shunt, series, compound, and separate amplifier GDC 3. Calculates the GDC and MDC gain currents of shunt, series, compound, and separate GDC amplifiers 4. Calculates GDC and MDC load currents of shunt, series, compound, and separate amplifier GDC 5. Calculates armature current of GDC and MDC of shunt, series, compound, and separate amplifier GDC 6. Calculating the number of GDC and MDC armature turns of shunt, series, compound, and separate amplifier GDC 7. Calculates rotation speed of shunt, series, and compound MDC and separate gain MDC	**Criteria:** 1. Accuracy of GDC and MDC voltage calculations on shunt, series, compound, and on separate amplifier GDC, max score 10 2. Accuracy of voltage loss calculations on GDC and MDC shunt, series, compound, and separate amplifier GDC, max score 10 3. Current count accuracy of shunt GDC and MDC gain, series, compound and separate amplifier GDC, max score 10 4. Precise calculation of GDC and MDC load currents of shunt, series, compound and separate amplifier GDC, max score 10 5. Accuracy of armature current calculation of GDC and MDC of shunt, series, compound and separate amplifier GDC, max score 10 6. Accuracy of shunt GDC and MDC armature winding count, series, compound and separate amplifier GDC, max score 10 7. Speed count accuracy of shunt, series, compound and separate booster MDCs, max score 20 8. Accuracy of shunt, series, compound and separate gain MDC voltage loss calculations, max score 18 9. Participative, max score 2 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case studies. Students search for sources of information, read digital textbooks, hold discussions, and carry out calculations of quantities and present the results. 100 minutes	**Material:** Calculation of quantities in DC generators and DC motors **Reference:** *Stephen J. Chapman, 2012. Electric Machine Fundamentals Fifth Edition. MCGraw-Hill: New York*	3%
5	Analyze and prove the characteristics of DC generators and DC motors	1. Create an experimental design 2. Draw a series of experiments 3. Take measurements and enter the results in the data table 4. Carry out data interpretation 5. Accuracy of data analysis 6. Make characteristic conclusions 7. participative	**Criteria:** 1. Accuracy of experimental design, max score 15 2. Sequence image accuracy, max score 15 3. Accuracy of measurement results and data tables, max score 15 4. Accuracy of data interpretation, max score 15 5. Accuracy of data analysis, max score 15 6. Accuracy of characteristic conclusions, max score 23 7. Participative, max score 2 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case Studies. Students in groups carry out testing of GDC and MDC characteristics, by preparing experimental designs, tool and material requirements, drawing circuits, making data tables, and testing GDC and MDC characteristics, making and data tables. 50 minutes	Case study. From the data that has been obtained, students hold discussions to interpret the data, analyze the data and draw conclusions on the results of proving the characteristics of GDC and MDC 50 minutes	**Material:** Analyzing and proving the characteristics of DC generators **Reference:** *Joko, 2016. Direct Current Machines. University Press: Surabaya*	3%

6	Calculating losses and efficiency of DC generators and DC motors, and DC generator voltage regulation	1. Calculating losses on GDC and MDC 2. Calculating efficiency on GDC and MDC 3. Calculating voltage regulation on GDC 4. Participative	**Criteria:** 1. GDC and MDC loss calculation accuracy, max score 40 2. GDC and MDC efficiency calculation accuracy, max score 40 3. GDC and MDC voltage regulation calculation accuracy, max score 18 4. Participative, max score 2 **Form of Assessment** : Participatory Activities, Portfolio Assessment	50 minutes	Case studies. Students explore sources of information and conduct discussions to complete assessments of GDC and MDC losses and efficiency, and calculate 100 minute GDC voltage regulation	**Material:** Characteristics of DC generators and DC motors **Reference:** *Joko, 2016. Direct Current Machines. University Press: Surabaya*	3%

7	Able to solve actual problems related to DC generators and DC motors according to applicable provisions/regulations, and present the results	1. Activeness in exploring sources of information, discussions and presentations, max score 3 2. Accuracy of information sources accessed, max score 20 3. Accuracy of procedures for solving problems, max score 20 4. Correctness of the final result of solving the problem, max score 20 5. Quality of content, video and duration of video presentation sent by the link, max score 17	**Criteria:** 1. Accuracy of identifying problems, max score 20 2. Accuracy of information sources accessed, max score 20 3. Accuracy of procedures for solving problems, max score 20 4. Correctness of the final result of solving the problem, max score 20 5. Quality of content, video, and duration of presentation video sent by the link, max score 17 6. Activeness in exploring sources of information, discussions and presentations, max score 3 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case studies. Given practice questions in the form of actual problems, students search for relevant sources of information to discuss. Next, students solve actual problems and students complete and conduct discussions and present the results and collect portfolios. Assignment 7. Electrical Machines A. Instructions: 1. The score is listed for each question item 2. MsWord answer file, calculation using eguation 3. The score is maximum if answer accompanied by picture B. Question Items 1. A DC generator, having a load current of 30 A at a terminal voltage of 110 V with a load current of 30A 110 V requires mechanical energy of 4500 Joules/second. Determine the efficiency of the generator (max score 10) 2. A DC Shunt generator supplies a current of 95A at a voltage of 220V. Armature resistance 0.2 Ω, shunt resistance 60 Ω. Iron and friction losses are 2000 W. Determine the generator efficiency (max score 10) 3. A 200V DC Sunt DC shunt motor requires a current of 7 when rotating with zero load. The armature resistance is 0.2 Ω and the shunt resistance is 100 Ω. Calculate: (a) iron loss and friction loss (max score 5) (b) shaft power when the load current is 62 A assuming constant iron and friction losses (max score 5) 4. A DC generator with no load voltage of 230 V and load voltage full 220 V. Determine the voltage regulation of the generator (max score 20) 5. A 4-pole DC generator with a wave-wound winding type has 51 slots, each slot contains 20 conductors. What voltage is produced when rotated at 1500 RPM assuming a polar flux of 0.7 mWb (max score 10) 6. An open circuit DC Shunt generator has an induced voltage of 115 V. If the engine voltage at full load is 110 V, determine the load current if the resistance field winding 15 Ω and armature resistance 0.02 Ω. Ignore the armature reaction (max score 10) 7. A separate amplifier DC generator rotated at 1200 RPM supplies a current of 200 A when the terminal voltage is 110 V. What is the magnitude of the current when the rotation decreases to 1000 RPM and the gain current decreases by 80%. Armature resistance is 0.04 Ω and total brush loss is 2 V. Ignore saturation and armature reaction (max score 20). 8. An 8 pole DC generator has 500 conductors, flux per pole 0.05. (a) If the windings are connected lap-connected and rotated at 1200 RPM, what is the generator emf voltage (max score 5) (b) If the rotation speed is the same, the windings are wave-wound connected, what is the generator emf voltage (max score 5) 100	**Material:** calculating losses and efficiency of DC generators and DC motors, and voltage regulation of DC generators **Reference:** *Slobodan N. Vukosavic, 2013. Electrical Machines. Springer-Verlag: New York*	3%

8	UTS: Able to solve daily problems related to DC generators and DC motors	1.Participative 2.Identify the problem 3.Sequence and ways of solving problems 4.The final result of solving the problem	**Criteria:** 1.Participative, max score 8.5 2.Accuracy of identifying problems, score, max 31.5 3.Correct order and how to solve problems, max score 40 4.Accuracy of final problem solving results, max score 20 **Form of Assessment** : Participatory Activities, Tests	Doing UTS Problems A 4-pole DC generator has an armature winding consisting of 648 conductors connected in two parallel circuits. Flux per pole is 0.321.10^6 maxwell and armature rotation speed is 1500 rpm. Determine: the average voltage generated.	Case studies. 100	**Material:** GDC and MDC **Reference:** *Slobodan N. Vukosavic, 2013. Electrical Machines. Springer-Verlag: New York*	20%
9	Compare the meaning, working principles and functions of synchronous/asynchronous generators and synchronous/asynchronous motors	1.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases in terms of understanding 2.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases in terms of working principles 3.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases, in terms of function and notation	**Criteria:** 1.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases in terms of understanding, max score 30 2.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases in terms of working principles, max score 40 3.Accuracy in analyzing and concluding the differences between synchronous generators, asynchronous generators, synchronous motors, asynchronous motors, both for 1 phase and 3 phases in terms of function, max score 30 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case study: Searching for sources of information, discussing, identifying, interpreting, analyzing and concluding the differences in understanding, working principles and functions of synchronous/asynchronous generators and synchronous/asynchronous motors and collecting the results individually (Online). 100 minutes	**Material:** Differences in understanding, working principles and functions of synchronous generators, asynchronous generators, synchronous motors and asynchronous motors **Reference:** *Stephen J. Chapman, 2012. Electric Machinery Fundamentals Fifth Edition. MCGraw-Hill: New York*	4%
10	Identifying the Types and Notations of Synchronous/Asynchronous Generators and Synchronous/Asynchronous Motors	1.Active identification, tracing sources of information and discussions 2.Accuracy of identification results of the type and function of synchronous/asynchronous generator/motor 3.Accuracy of analysis results 4.Accuracy of conclusions on the types of synchronous/asynchronous generators/motors	**Criteria:** 1. 2.Active in identifying, tracing sources of information, and discussing, max score 30 3.Accuracy of identification results and functions of the parts, max score 25 4.Accuracy of analysis results, max score 25 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case studies. directly identify the type and notation of synchronous/asynchronous generators and synchronous/asynchronous motors 60	Case studies. Students search for sources of information, discuss and identify, draw details, interpret, analyze and conclude the types and notations of synchronous/asynchronous generators and synchronous/asynchronous motors 40 minutes	**Material:** Able to identify the types and notation of synchronous generators and synchronous motors, asynchronous generators and motors **. Literature:**	4%

11	Able to identify, analyze and conclude the differences between synchronous/asynchronous generator parts and synchronous/asynchronous motors and their functions	1. Participative when carrying out identification and discussions 2. Accuracy of identification 3. Accuracy of analysis results 4. Accuracy of the conclusions of the parts and their functions	**Criteria:** 1. Participative when identifying and discussing, max score 40 2. Accuracy of identification results, max score 20 3. Accuracy of analysis results, max score 20 4. Accuracy of conclusions about the parts and their functions, max score 20 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case studies. identify and make detailed drawings of synchronous/asynchronous generator/motor parts through direct observation 40	Case studies. Students search for sources of information, discuss and identify, draw details, interpret, analyze and conclude the parts of a DC generator/motor and their functions 60 minutes	**Material:** Carrying out measurements and calculations of quantities on DC generators and DC motors **Reference:** *Joko, 2018. Alternating Current Machines. University Press: Surabaya*	4%
12	able to calculate quantities on synchronous/asynchronous generators and synchronous/asynchronous motors	1. Participative when searching for sources of information, discussions, and carrying out calculations 2. Accuracy in calculating quantities for 1 phase and 3 phase synchronous generators 3. Accuracy in calculating quantities for 1 phase and 3 phase induction generators 4. Accuracy in calculating quantities for 1 phase and 3 phase synchronous motors 5. Accuracy in calculating quantities for 1 phase and 3 phase asynchronous motors	**Criteria:** 1. Participative, max score 40 2. Accuracy in calculating quantities for 1 phase and 3 phase synchronous generators, max score 15 3. Accuracy in calculating quantities for 1 phase and 3 phase asynchronous generators, max score 15 4. Accuracy in calculating quantities for 1 phase and 3 phase synchronous motors, max score 15 5. Accuracy in calculating quantities for 1 phase and 3 phase asynchronous motors, max score 15 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case study 100 minutes	**Material:** Calculation of quantities in AC generators and AC motors **References:** **Material:** Calculation of quantities in AC generators and AC motors **Reference:** *Stephen J. Chapman, 2012. Electric Machinery Fundamentals Fifth Edition. MCGraw-Hill: New York*	4%
13	Able to identify, test, interpret, analyze and prove the characteristics of synchronous/asynchronous generators and synchronous/asynchronous motors	1. Participative 2. Accuracy in making characteristics 3. Accuracy in analyzing the characteristics that have been obtained compared to characteristics based on theory and theory 4. Accuracy of conclusions	**Criteria:** 1. Participative, max score 40 2. Accuracy in creating characteristics, max score 20 3. Accuracy of analysis results, max score 20 4. Conclusion accuracy, max score 20 **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case Studies. Students in groups carry out characteristic testing of synchronous/asynchronous generators, synchronous/asynchronous motors, by preparing experimental designs, tool and material requirements, drawing circuits, making data tables, and carrying out characteristic tests, making and data tables. 60 minutes	Students hold discussions to interpret data, analyze data and draw conclusions on the results of proving the characteristics of synchronous/asynchronous generators and synchronous/asynchronous motors 40 minutes	**Material:** Characteristics of synchronous/asynchronous generators and synchronous/asynchronous motors **Reference:** *Stephen J. Chapman, 2012. Electric Machinery Fundamentals Fifth Edition. MCGraw-Hill: New York*	4%

14	Able to calculate losses and efficiency of synchronous/asynchronous generators and synchronous/asynchronous motors, calculate generator voltage regulation and calculate induction motor slip	1. Participation 2. Calculating losses, efficiency and voltage regulation of 1 phase and 3 phase synchronous generators 3. Calculating losses, efficiency and voltage regulation of 1 phase and 3 phase asynchronous generators 4. Calculating losses, efficiency and slip of 1 phase and 3 phase synchronous motors 5. Calculating losses, efficiency and slip of 1 phase and 3 phase synchronous motors	**Criteria:** 1. Participation, max score 40 2. Accuracy of calculating losses, efficiency and voltage regulation of 1 phase and 3 phase synchronous generators, max score 15 3. Accuracy of loss calculation results, efficiency and voltage regulation of 1 phase and 3 phase induction generators, max score 15 4. Accuracy of loss, efficiency and slip calculation results for 1 phase and 3 phase synchronous motors, max score 15 5. Accuracy of loss, efficiency and slip calculation results for 1 phase and 3 phase asynchronous motors, max score 1 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case study. Students study e-books, explore sources of information, have discussions to calculate losses and efficiency of synchronous/asynchronous generators, synchronous/asynchronous motors, both 1 phase and 3 phase, generator voltage regulation and asynchronous motor slip and present the results 100 minutes	**Material:** Losses and efficiency of synchronous/asynchronous generators and synchronous/asynchronous motors, slip and voltage regulation. **Reference:** *Slobodan N. Vukosavic, 2013. Electrical Machines. Springer-Verlag: New York*	4%
15	Able to solve actual problems related to synchronous/asynchronous generators and synchronous/asynchronous motors in accordance with applicable provisions/regulations, and present the results	1. Actively exploring sources of information, discussions and presentations 2. The accuracy of the information sources accessed 3. Accuracy in problem solving procedures 4. Completeness of problem solving 5. The correctness of the final result of solving the problem 6. The quality of the content, presentation video and the duration of the presentation video sent by the link	**Criteria:** 1. Accuracy of identifying problems, max score 20 2. Accuracy of information sources accessed, max score 20 3. Accuracy of procedures for solving problems, max score 20 4. Correctness of the final result of solving the problem, max score 20 5. Quality of content, video and duration of video sent by the link, max score 17 6. Activeness in exploring sources of information, discussions and presentations, max score 3 **Form of Assessment** : Participatory Activities, Portfolio Assessment		Case studies. Given practice questions in the form of actual problems, students search for relevant sources of information to discuss. Next, students solve actual problems and students complete and hold discussions and present the results and collect a portfolio for 100 minutes	**Material:** Actual problems related to generators and DC motors in accordance with provisions/regulations, and presenting the results. **Reference:** *Stephen J. Chapman, 2012. Electric Machine Fundamentals Fifth Edition. MCGraw-Hill: New York*	5%
16	UAS (Able to solve problems with DC generators, DC motors, synchronous generators, induction generators, synchronous motors and asynchronous motors	1. Identifying problems 2. Sequence of solving problems 3. How to solve the problem 4. The final result of solving the problem	**Criteria:** 1. Participative, max score 10 2. Accuracy in identifying problems, max score 20 3. Accuracy in solving problems, max score 25 4. Accuracy in solving problems, max score 25 5. Accuracy of final problem solving results, max score 20 **Form of Assessment** : Participatory Activities, Tests		Case study 100 minutes	**Material:** Final Semester Exam Solving actual problems with DC Generators/Motors, Synchronous/Asynchronous Generators, Synchronous/Asynchronous Motors **Library:** *Stephen J. Chapman, 2012. Electric Machinery Fundamentals Fifth Edition. MCGraw-Hill: New York*	30%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	51.5%
2.	Portfolio Assessment	23.5%
3.	Test	25%
		100%

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.