	Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Undergraduate Physics Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Energy Materials	4520103244	Study Program Elective Courses	T=2	P=0	ECTS=3.18	6	November 30, 2019

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-11	Design and conduct experiments in physics learning by applying scientific methods
	Program Objectives (PO)	
	PO - 1	Students master the theoretical concepts and applications of renewable energy
	PO - 2	Students master material knowledge for rechargeable batteries (Rechargeable Batteries)
	PO - 3	Students master the theory and application of materials for supercapacitors (SC)
	PO - 4	Students master the knowledge and application of semiconductor-based renewable energy (SK): Photovoltaics (Solar Cell)
	PO - 5	Students master the knowledge and application of geothermal-based renewable energy (hydrothermal power): geothermal energy, geothermal power plants.
	PO - 6	Students master the knowledge and application of water-based renewable energy: hydroelectric-energy, hydroelectric power plants.
	PO - 7	Students master the knowledge and application of biomass-based renewable energy (biomass energy)
	PO - 8	Students master the knowledge and application of biomass-based renewable energy: Nuclear as a zero-emission energy source
	PO - 9	Students master the knowledge and application of hydrogen-based renewable energy, Hydrogen: the energy carrier of the future
	PLO-PO Matrix	

P.O	PLO-11
PO-1	
PO-2	
PO-3	
PO-4	
PO-5	
PO-6	
PO-7	
PO-8	
PO-9	

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																
PO-2																
PO-3																
PO-4																
PO-5																
PO-6																
PO-7																
PO-8																
PO-9																

Short Course Description	In this lecture various sources of renewable energy are discussed, materials as basic materials for device fabrication, which include: (1) materials for rechargeable batteries and supercapacitors or ultracapacitors which include their components, namely electrodes (anode, cathode), electrolyte and separator ; (2) semiconductor materials (crystal & amorphous silicon, organic, polymer), PN junction, LED, DSSC and for Photovoltaics (Solar Cells). Discusses various other renewable energy sources, which have great potential to be developed in Indonesia, such as: (3) energy using water (hydroelectric-energy) which has enormous potential to be developed in Indonesia for added value in dam buildings; (4) geothermal energy (hydrothermal energy) and PLTP in Indonesia; (5) biomass-based energy which is climate-friendly oriented, fast-growing trees and bamboo, biodiesel, bioethanol, etc.; (6) nuclear energy as an energy source with carbon emissions; and (7) the potential of hydrogen as a very abundant future energy source.

References	**Main :**	
	1. Buku Sintesis Hijau Nanopartikel Fungsional yang disusun oleh Prof. Dr. Munasir, S.Si., M.Si. 2. Kumpulan artikel dari berbagai jurnal internasional yang cokupannya dibidang sains material dan yang relevan, yang memiliki aspek kebaharuan pada bidang teknologi material, dengan scop: energi terbarukan, baterai, superkapasitor, fotovoltaik, solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy dan hydrogen-energy	
	Supporters:	
	1. Williem D. Callister, Jr., Materials Science and Engineering an Introduction., Sixth Edition, Wiley International Editions., John Wiley & Sons. Inc., 2003. 2. Masuo Hosokawa, Kiyoshi Nogi, Makio Naito, Toyokazu Yokoyama, Nanoparticle Technology Handbook, Elsivier, Tokyo, First Edition, 2007 3. Suresh G. Advani, Processing and Properties of Nanocomposite, University of Dalaware USA, World Scientific Publishing Co.Pte.Ltd, 2007. 4. Jeremy Ramsden, Nanotechnology, Free Study Books, www. BOOKBOON.COM, @Jaremy Ramsden & Ventus Publishing ApS, 2009 5. Jasprit Singh, Semikonduktor Optoelectronic, Physics and Technology. McGRAW-Hill International Editions,2005. 6. Jurnal Material Latters : https://www.journals.elsevier.com/materials-letters/ 7. Jurnal Material Science-Poland: https://content.sciendo.com/view/journals/msp/msp-overview.xml?lang=en&tab_body=container-toc	
Supporting lecturer	Prof. Dr. Munasir, S.Si., M.Si. Lydia Rohmawati, S.Si., M.Si.	

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	Able to master the concepts of: Rechargeable batteries, Supercapacitors, semiconductor-based photovoltaics (Si, Polymer, Organic), and other renewable energies	1.Explain the theory and structure of rechargeable batteries 2.Explain the theory and structure of supercapacitors 3.Explain semiconductor theory, carrier transport in PN junctions of silicon semiconductors & organic or polymer semiconductors	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Rechargeable batteries, supercapacitors and semiconductors **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	5%
2	Students are able to master the concept of rechargeable batteries - Li-ion batteries: how they work and structure: electrodes (cathode, anode), sparator and electrolyte	1.Explain the theory and structure of rechargeable batteries 2.Explain the theory and structure of supercapacitors 3.Explain semiconductor theory, carrier transport in PN junctions of silicon semiconductors & organic or polymer semiconductors	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Li-Ion Batteries **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have new aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal , organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
3	Students are able to master the concept of rechargeable batteries - Li-ion batteries: how they work and structure: electrodes (cathode, anode), sparator and electrolyte	1.Explain the theory and structure of rechargeable batteries 2.Explain the theory and structure of supercapacitors 3.Explain semiconductor theory, carrier transport in PN junctions of silicon semiconductors & organic or polymer semiconductors	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Li-Ion Batteries **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have new aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal , organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%

4	Students master the theory and application of materials for supercapacitors (SC): materials for electrodes, separators and electrolytes based on advanced materials.	1. Explain the theory and characteristics of supercapacitors 2. Explains the characteristics of advanced materials for supercapacitor components: anode and cathode 3. Explains the characteristics of advanced materials for supercapacitor components: separators 4. Describes the characteristics of advanced materials for supercapacitor components: electrolytes	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Supercapacitor, how it works and structure: electrode, separator and electrolyte. Latest research trends: advanced materials for supercapacitors (electrodes, separators) **Library:** *Collection of articles from various international journals covering the field of materials science and those that are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics , solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
5	Students master the theory and application of materials for supercapacitors (SC): materials for electrodes, separators and electrolytes based on advanced materials.	1. Explain the theory and characteristics of supercapacitors 2. Explains the characteristics of advanced materials for supercapacitor components: anode and cathode 3. Explains the characteristics of advanced materials for supercapacitor components: separators 4. Describes the characteristics of advanced materials for supercapacitor components: electrolytes	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Supercapacitor, how it works and structure: electrode, separator and electrolyte. Latest research trends: advanced materials for supercapacitors (electrodes, separators) **Library:** *Collection of articles from various international journals covering the field of materials science and those that are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics , solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
6	Students master renewable energy based on semiconductors: PN connections, LEDs, DSSC and Photovoltaics	1. Explain the basic concepts of semiconductors (intrinsic, extrinsic: donor, acceptor) 2. Explain the concept of charge carriers in semiconductors (electrons, holes), Fermi energy levels (Ef), conduction (Ec) and valence (Ev) 3. Explain the concept of PN connection: drift current, diffusion current 4. Explaining the performance of Laser emitting diodes (LEDs) 5. Explains the concept of DSSC (Dyes Sensitized Solar-Cell) and several examples 6. Explain the concept and performance of Photovolatics (Solar Cells)	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Semiconductors, PN junctions, LEDs, DSSC and Photovoltaics **Library:** *Collection of articles from various international journals covering the field of materials science and those which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%

7	Students master renewable energy based on semiconductors: PN connections, LEDs, DSSC and Photovoltaics	1. Explain the basic concepts of semiconductors (intrinsic, extrinsic: donor, acceptor) 2. Explain the concept of charge carriers in semiconductors (electrons, holes), Fermi energy levels (Ef), conduction (Ec) and valence (Ev) 3. Explain the concept of PN connection: drift current, diffusion current 4. Explaining the performance of Laser emitting diodes (LEDs) 5. Explains the concept of DSSC (Dyes Sensitized Solar-Cell) and several examples 6. Explain the concept and performance of Photovolatics (Solar Cells)	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Semiconductors, PN junctions, LEDs, DSSC and Photovoltaics **Library:** *Collection of articles from various international journals covering the field of materials science and those which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
8		1. Mastering the concepts and applications of advanced materials for battery applications and rechargeable battery performance 2. Mastering the concepts and applications of advanced materials for supercapacitors and supercapacitor performance 3. Mastering the concepts and applications of advanced materials for semiconductors, and their applications: PN connections, LEDs, Photovolataics (SC), and DSSC	**Criteria:** 1. Quantitative 2. Qualitative **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Practice / Performance	Paper presentations, PPT and questions and answers 2 x 50	Paper presentations, PPT and questions and answers 2 x 50	**Material:** Rechargeable Batteries, Supercapacitors and Semiconductors / DSSC **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	30%

9	Students master the knowledge and application of geothermal-based renewable energy (hydrothermal power): the potential of geothermal energy, geothermal power plants (PLTP) in Indonesia and their development prospects	1. Explain geothermal theory, geothermal heat as an energy source 2. Explains the theory and concept of PLTP-based renewable energy 3. Identify PLTP for household or industrial electrical energy supply 4. Analyzing Power Plants for geothermal sources 5. Analyzing nuclear power plants in Indonesia and their prospects as providers of renewable electrical energy	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Geothermal Power Plants or PLTP **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
10	Students master the knowledge and application of water-based renewable energy: hydroelectric energy, hydroelectric power plants: hydroelectric power plants (PLTA) in Indonesia, and development prospects for future energy in Indonesia	1. Explain the theory of hydroelectric - energy bottom-up processes) 2. Explain the power plan for hydropower-based energy, and its types 3. Hydroelectric power plants (PLTA) in Indonesia 4. Prospects for developing independent hydropower as a source of household energy.	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** PLTA **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have new aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal, organic) , hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%
11	Students master the knowledge and application of water-based renewable energy: hydroelectric energy, hydroelectric power plants: hydroelectric power plants (PLTA) in Indonesia, and development prospects for future energy in Indonesia	1. Explain the theory of hydroelectric - energy bottom-up processes) 2. Explain the power plan for hydropower-based energy, and its types 3. Hydroelectric power plants (PLTA) in Indonesia 4. Prospects for developing independent hydropower as a source of household energy.	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** PLTA **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have new aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal, organic) , hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%

12	Students master the knowledge and application of biomass-based renewable energy (biomass energy), renewable biomass energy: climate - friendly, renewable energy, fast - growing trees and bamboo, biodiesel, bioethanol, etc.	1. Explain the types of biomass sources, and the theory and technology of their development 2. Explaining Biomass - energy: climate-friendly and renewable energy 3. Explains the concept of biomass - energy: fast - growing trees and bamboo 4. Explain the biomass process for: Biodiesel 5. Explain the biomass process for: Bioethanol 6. Explain the biomass process for: Charcoal Briquettes	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Biomass-based renewable energy **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal , organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy* **Material:** Biomass for Diesel **Library:** *Material Latters Journal: https://www.journals.elsevier.com/...* **Material:** Biomass for Ethanol **Library:** *Material Latters Journal: https://www.journals.elsevier.com/...* **Material:** Biomass for energy **Library:** *Journal of Material Science-Poland: https://content.sciendo.com/...*	2%
13	Students master the knowledge and application of biomass-based renewable energy (biomass energy), renewable biomass energy: climate - friendly, renewable energy, fast - growing trees and bamboo, biodiesel, bioethanol, etc.	1. Explain the types of biomass sources, and the theory and technology of their development 2. Explaining Biomass - energy: climate-friendly and renewable energy 3. Explains the concept of biomass - energy: fast - growing trees and bamboo 4. Explain the biomass process for: Biodiesel 5. Explain the biomass process for: Bioethanol 6. Explain the biomass process for: Charcoal Briquettes	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Biomass-based renewable energy **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal , organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy* **Material:** Biomass for Diesel **Library:** *Material Latters Journal: https://www.journals.elsevier.com/...* **Material:** Biomass for Ethanol **Library:** *Material Latters Journal: https://www.journals.elsevier.com/...* **Material:** Biomass for energy **Library:** *Journal of Material Science-Poland: https://content.sciendo.com/...*	2%
14	Students master the knowledge and application of renewable energy based on atomic nuclear reactions. The concept of decay of atomic nuclei (fusion and fission), enrichment of Uranium atomic nuclei, Nuclear as a source	1. Explain the theory of atomic nuclear reactions: Fission and Fusion reactions 2. Explaining the theory and enrichment of Uranium (U) atoms 3. Explain the concept and theory of electricity generation with a nuclear reactor 4. Nuclear Power Plants (PLTN) as a source of electricity with zero carbon emissions 5. Explaining the use of nuclear power for humans and life 6. Explaining nuclear power plants and energy needs in Indonesia	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** nuclear power plant, nuclear-based clean energy **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	2%

15	Students master the knowledge and application of Hydrogen as an energy source, hydrogen production as an energy source, hydrogen as an alternative source of future energy carriers	1. Explains the reaction principle of hydrogen atoms as an energy source: forms of hydrogen: gas, liquid and solid. 2. Explain the hydrogen energy production system 3. Explain the technology and principles of storing hydrogen energy: hydrogen storage 4. Nuclear Power Plants (PLTN) as a source of electricity with zero carbon emissions 5. Explain hydrogen energy to supply daily energy needs. 6. Explaining the potential for developing hydrogen-based renewable energy	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers 2 x 50	Presentations, discussions and questions and answers 2 x 50	**Material:** Energy based on hydrogen reactions. **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics, solar cells, semiconductors (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	5%
16	Sub-CPMK 4 to Sub-CPMK 9	Mastering the papers (articles, posters) presented	**Criteria:** Quantitative **Form of Assessment** : Participatory Activities	Presentation, Question and answer 2 x 50	Presentation, Questions and Answers 2 x 50	**Material:** PLTP, PLTA, PLTN, Biomass, and Hydrogen Energy **Library:** *Collection of articles from various international journals which cover the field of materials science and which are relevant, which have novel aspects in the field of materials technology, with scope: renewable energy, batteries, supercapacitors, photovoltaics , solar cell, semiconductor (crystal, organic), hydrothermal energy, geothermal power plant, water-energy, nuclear power, nuclear power plant, biomass-energy and hydrogen-energy*	30%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	63%
2.	Project Results Assessment / Product Assessment	16%
3.	Portfolio Assessment	7.5%
4.	Practice / Performance	7.5%
		94%

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.