	Universitas Negeri Surabaya Faculty of Engineering, Mechanical Engineering Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Energy Conversion Machine 1	2120102130		T=2	P=0	ECTS=3.18	3	July 16, 2024

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-5	Work independently and in groups
	PLO-11	Design and development of solutions that take into account the environment and sustainability
	PLO-14	Science and engineering knowledge
	Program Objectives (PO)	
	PO - 1	Able to collaborate, analyze and present matters related to energy sources, both renewable and non-renewable and able to make fuel from biomass
	PLO-PO Matrix	

P.O	PLO-5	PLO-11	PLO-14
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	The BKSTM curriculum-based Energy Conversion Machine material contains material on Understanding energy profiles with 3 discussion sub-chapters, Understanding energy and basic concepts of energy conversion systems with 6 discussion sub-chapters, energy conversion machine calculations with 6 discussion sub-chapters and finally the application of energy conversion systems with 3 discussion sub-chapters. discussion chapter

References

Main :

1. Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010
2. Siregar, Indra Herlamba. (2007), Mesin Konversi Energi, Surabaya, UniPress
3. Graziani , Mauro and Paolo Fornasiero. (2007), RENEWABLE RESOURCES AND RENEWABLE ENERGY A GLOBAL CHALLENGE, New York, CRC Press
4. Kreith, F, Goswami, DY. (2007), Energy Conversion (Mechanical Engineering), New York, CRC Press
5. Weston, Kenneth C, (2000), Energy Conversion, Brooks/Cole publisher

Supporters:

1. Kementrian energi dan mineral Indoensia, (2022), Handbook energy and economic statistic of Indonesia, Jakarta
2. British Petroleun, (2022), Statistical Review of World Energy, London

Supporting lecturer	Indra Herlamba Siregar, S.T., M.T. Ir. Priyo Heru Adiwibowo, S.T., M.T. Dany Iman Santoso, S.T., M.T. Diastian Vinaya Wijanarko, 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	Able to understand, describe and classify energy sources and reserves, calculate world and national energy needs	Explain and classify energy sources and reserves to calculate world and national energy needs	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions, Giving Assignments 2 X 50	1. Lecture agreement for one semester 2. Overview of the course on Energy Conversion Machines 3. Assignment to read literature related to energy sources and reserves in Indonesia and the world	**Material:** Definition, classification of national and world energy sources and reserves **References:** *Siregar, Indra Herlamba. (2007), Energy Conversion Machines, Surabaya, UniPress*	3%
2	Able to understand, describe and classify energy sources and reserves, calculate world and national energy needs	Explain and classify energy sources and reserves to calculate world and national energy needs	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case study of energy sources and reserves in Indonesia and the world 1. Group discussion 2. Class discussion 3. Presentation of results for each group via social media 4. Reading literature related to Indonesia and world energy needs 2 X 50		**Material:** Definition, classification of national and world energy sources and reserves **References:** *Siregar, Indra Herlamba. (2007), Energy Conversion Machines, Surabaya, UniPress* **Material:** all of chapters **Bibliography:** *Ministry of energy and minerals of Indonesia, (2022), Handbook energy and economic statistics of Indonesia, Jakarta*	5%

3	Able to calculate the energy needs of Indonesia and the world	Able to classify types of energy	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case study calculating the energy needs of Indonesia and the world in 2030 1. Group Discussion 2. Class Discussion 3. Presentation of results for each group via social media 4. Reading assignment Fuel for energy conversion process 2 X 50		**Material:** all of chapters **References:** *British Petroleun, (2022), Statistical Review of World Energy, London*	5%
4	master the Laws and equations in energy conversion	able to describe and apply laws and equations in energy conversion	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures and discussions 2 X 50		**Material:** Energy conversion fundamentals **Reference:** *Weston, Kenneth C, (2000), Energy Conversion, Brooks/Cole publisher*	2%
5	create a concept map of resources and classification of energy conversion machines	Able to understand, describe resources and classify energy conversion machines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case study identifying and creating resource concept maps 1. Group Discussion 2. Class Discussion 3. Presentation of results for each group via social media 4. Assignment to read literature related to the classification of energy conversion machines 2 X 50		**Material:** All Chapters **Bibliography:** *Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010*	5%
6	create a concept map of resources and classification of energy conversion machines	Able to understand, describe resources and classify energy conversion machines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case study identifying and classifying energy conversion machines 1. Group Discussion 2. Class Discussion 2 X 50		**Material:** All Chapters **Bibliography:** *Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010*	2%

7	create a concept map of resources and classification of energy conversion machines	Able to understand, describe resources and classify energy conversion machines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case study identifying and classifying energy conversion machines (continued) 1. Class Discussion 2. Presentation of results on social media 2 X 50		**Material:** All Chapters **Bibliography:** *Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010* **Material:** 5 **Bibliography:**	5%
8	UTS		**Form of Assessment** : Participatory Activities	1. Written test or reviewing student portfolios 2 X 50			20%
9	students are able to make fuel from biomass	able to describe fuels in energy conversion	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Fuel for energy conversion processes **References:** *Siregar, Indra Herlamba. (2007), Energy Conversion Machines, Surabaya, UniPress*	2%
10	students are able to make fuel from biomass	able to describe fuels in energy conversion	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case Study of making biogas 1. Group Discussion regarding making a simple digester for making biogas 2. Class Discussion 2 X 50		**Material:** Fuel for energy conversion processes **References:** *Siregar, Indra Herlamba. (2007), Energy Conversion Machines, Surabaya, UniPress*	3%
11	students are able to make fuel from biomass	able to describe fuels in energy conversion	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	1. Presentation of Group Work Results 2. Assignment to read literature related to renewable energy 2 X 50		**Material:** Fuel for energy conversion processes **References:** *Siregar, Indra Herlamba. (2007), Energy Conversion Machines, Surabaya, UniPress*	5%
12	able to create a renewable energy concept map	able to describe renewable energy	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case study create a renewable energy concept map 1. Group Discussion 2. Class Discussion 2 X 50		**Material:** All of Chapter **Bibliography:** *Graziani, Mauro and Paolo Fornasiero. (2007), RENEWABLE RESOURCES AND RENEWABLE ENERGY A GLOBAL CHALLENGE, New York, CRC Press*	3%

13	able to create a renewable energy concept map	able to describe renewable energy	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	Case study create a renewable energy concept map 1. Presentation of group work results 2. Non-renewable energy literature assignment 2 X 50		**Material:** All Chapters **Bibliography:** *Graziani, Mauro and Paolo Fornasiero. (2007), RENEWABLE RESOURCES AND RENEWABLE ENERGY A GLOBAL CHALLENGE, New York, CRC Press*	5%
14	able to create a non-renewable energy concept map	able to describe non-renewable energy	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Case study create a non-renewable energy concept map 1. Group Discussion 2. Class Discussion 2 X 50		**Material:** Energy Resources **References:** *Kreith, F, Goswami, DY. (2007), Energy Conversion (Mechanical Engineering), New York, CRC Press*	3%
15	able to create a non-renewable energy concept map	able to describe non-renewable energy	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	Group Presentation 2 X 50		**Material:** Energy Resources **References:** *Kreith, F, Goswami, DY. (2007), Energy Conversion (Mechanical Engineering), New York, CRC Press*	5%
16			**Form of Assessment** : Participatory Activities	Final exam			27%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	87.5%
2.	Portfolio Assessment	12.5%
		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.