	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 2	2120102131	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	4	February 4, 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 calculate the Performance of Energy Conversion Machines and able to conserve energy in vehicles, buildings and industry

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	Energy Conversion Machine material based on the BKSTM curriculum contains energy conversion machine calculation material with 6 discussion sub-chapters and finally the application of energy conversion systems with 3 discussion sub-chapters

References

Main :

1. Indra Herlamba Siregar, Mesin Konversi Energi, UniPress 2007
2. Kreith, F, Goswami, DY, Energy Conversion (Mechanical Engineering), CNC Press, 2007
3. Kreith, F, Goswami, DY, Energy management and Conservation Handbook, CNC Press, 2007
4. Patrick, D.R., et.al, Energy Conservation Guidebook, 3rd ed. Fairmont Press 2014
5. Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010
6. Youtube
7. PPT
8. https://www.youtube.com/watch?v=6NIVe_XRlRo
9. https://www.youtube.com/watch?v=lXBCJ7txUvI
10. Shalahuddin Hasan, Pelaksanaan Efisiensi Energi di Bangunan Gedung

Supporters:

Supporting lecturer	Indra Herlamba Siregar, S.T., M.T. Ir. Priyo Heru Adiwibowo, S.T., M.T. Dany Iman Santoso, 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	Be able to classify internal combustion motors	describe the classification of internal combustion engines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Internal combustion motors **Reference:** *Indra Herlamba Siregar, Energy Conversion Engines, UniPress 2007*	2%
2	Able to calculate the performance of an internal combustion engine	Able to calculate the performance of an internal combustion engine	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Practice/Performance	LectureDiscussionAssignment 2 X 50		**Material:** Internal combustion motors **Reference:** *Indra Herlamba Siregar, Energy Conversion Engines, UniPress 2007*	10%

3	Understand the working principles and main components of a steam generator system	Able to describe the working principles and main components of the Steam Power generating system	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures and Discussions 2 X 50		**Material:** Steam Generator Systems **References:** *Kreith, F, Goswami, DY, Energy Conversion (Mechanical Engineering), CNC Press, 2007* **Material:** Boiler **Library:** *Youtube* **Material:** Boiler **Library:** *PPT*	3%
4	Have the competence to collect data and analyze steam generator systems	Able to select data and analyze the performance of steam generator systems	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	Lectures, discussions and case studies 2 X 50		**Material:** Data and analysis of steam generator system performance. **Reference:** *Kreith, F, Goswami, DY, Energy Conversion (Mechanical Engineering), CNC Press, 2007* **Material:** Data and analysis of steam generator system performance. **Reference:** *PPT*	10%
5	Have the competence to collect data and analyze steam generator systems	Able to select data and analyze the performance of steam generator systems	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Portfolio Assessment	case study 2 X 50		**Material:** Data and analysis of steam generator system performance. **Reference:** *Kreith, F, Goswami, DY, Energy Conversion (Mechanical Engineering), CNC Press, 2007* **Material:** Data and analysis of steam generator system performance. **Reference:** *PPT*	10%
6	Understand the classification, working principles and analysis of fluid machines (pumps)	Able to describe resources and working principles and analysis of pump fluid machines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Pump **Library:** *Indra Herlamba Siregar, Energy Conversion Machine, UniPress 2007* **Material:** pump **Library:** *Youtube*	5%
7	Understand the classification, working principles and analysis of fluid machines (compressors)	Able to describe resources and working principles and analysis of fluid machines (compressors)	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Pump **Library:** *Indra Herlamba Siregar, Energy Conversion Machine, UniPress 2007* **Material:** pump **Library:** *Youtube*	5%
8	UTS			2 X 50			20%
9	students are able to classify cooling machines	able to classify cooling machines	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Classification of cooling machines **References:** *Indra Herlamba Siregar, Energy Conversion Machines, UniPress 2007*	5%
10	Students are able to analyze cooling machines thermodynamically	able to analyze cooling machines thermodynamically	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Cooling Systems **References:** *Indra Herlamba Siregar, Energy Conversion Machines, UniPress 2007*	2%
11	Students are able to analyze cooling machines thermodynamically	able to analyze cooling machines thermodynamically	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	Lectures, Discussions and Assignments 2 X 50		**Material:** Cooling Systems **References:** *Indra Herlamba Siregar, Energy Conversion Machines, UniPress 2007*	3%
12	students are able to theoretically carry out energy conservation in vehicles	theoretically able to conserve energy in vehicles	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Practice/Performance	LectureDiscussionAssignment 2 X 50		**Material:** Automotive Industry Energy Efficiency **Library:** *https://www.youtube.com/...*	10%
13	students are able to theoretically carry out energy conservation in the industrial sector	able to theoretically carry out energy conservation in the industrial sector	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	LectureDiscussionAssignment 2 X 50		**Material:** Energy Conservation Tips for Industrial and Commercial use **Library:** *https://www.youtube.com/...*	5%
14	students are able to theoretically carry out energy conservation in the industrial sector	able to theoretically carry out energy conservation in the industrial sector	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities	LectureDiscussionAssignment 2 X 50		**Material:** Energy Conservation Tips for Industrial and Commercial use **Library:** *https://www.youtube.com/...*	5%
15	Students are able to conserve energy in buildings	able to conserve energy in buildings	**Criteria:** according to the rubric **Form of Assessment** : Participatory Activities, Practice/Performance	LectureDiscussionAssignment 2 X 50		**Material:** Energy conservation of building air conditioning systems, **Reference:** *Shalahuddin Hasan, Implementation of Energy Efficiency in Buildings*	10%
16	Summative exam		**Form of Assessment** : Test				15%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	60%
2.	Portfolio Assessment	10%
3.	Practice / Performance	15%
4.	Test	15%
		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.