	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
Thermodynamics II	2120103099		T=3	P=0	ECTS=4.77	4	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Ir. Priyo Heru Adiwibowo, S.T., M.T.

Learning model	**Case Studies**
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	This course is an understanding of the Second Law of Thermodynamics regarding the concept of entropy and the application of thermodynamic cycles to the industrial world. The discussion begins with an introduction to the concepts of entropy, changes in entropy, and equilibrium entropy for control mass and control volume. Next is an introduction to the concept of exergy, exergy balance in control mass and control volume systems, and exergetic efficiency. Introduction of the Rankine cycle as a power producing cycle equipped with supporting equipment to optimize performance such as superheat, reheat and supercritical. Introduction of gas power systems such as Otto, Diesel, Dual and Brayton cycles which are equipped with reheat and intercooling.
References	**Main :**

1. Moran, Michael J., Howard N. Saphiro, Daisie D. Boettner, and Margareth B. Bailey, 2011, Fundamentals of Engineering Thermodynamics 7th ed., John Wiley & Sons.
2. Reynold, William C. and Perkin Henry C., 1977, Engineering Thermodynamics 2nd ed., McGraw-Hill.
3. Holman, 1980, Thermodynamics, 3rd ed., McGraw-Hill.
4. Kogakusha, Wood and Bernard D., 1982, Applications of Thermodynamics 2nd ed., Addison-Wesley.

	Supporters:
Supporting lecturer	Prof. Dr. Muhaji, S.T., M.T. Dr. Mohammad Effendy, S.T., M.T. Dany Iman Santoso, S.T., M.T. Ika Nurjannah, S.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	Understand the concept of entropy in control mass systems	Students are able to differentiate between reversible and irreversible processes	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 6 X 50			0%
2							0%
3	Understand the concept of entropy in control volume systems	Students are able to evaluate the isentropic efficiency of industrial equipment	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 6 X 50			0%
4							0%
5	Short Quiz 1	Short Quiz 1	**Criteria:** according to the rubric	Short Quiz 1 3 X 50			0%
6	Understand the concept of exergy in control mass systems	Students are able to understand exergy concepts, changes and balance	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 3 X 50			0%
7	Understand the concept of exergy in control volume systems	Students are able to calculate exergetic efficiency and heat loss costs	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 6 X 50			0%
8							0%
9	Short Quiz 2	Short Quiz 2	**Criteria:** according to the rubric	Short Quiz 2 3 X 50			0%
10	Understanding the Rankine cycle as a power generating cycle	Students are able to understand the Rankline cycle and its supporting tools	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 9 X 50			0%
11							0%
12							0%
13	Understand standard Otto and Diesel air cycles	Students are able to understand the Otto and Diesel cycles	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 3 X 50			0%
14							0%

15	Understand the Brayton standard air cycle	Students are able to understand the Brayton standard air cycle	**Criteria:** according to the rubric	Lectures, discussions, questions and answers, exercises and assignments 6 X 50			0%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

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.