



**Universitas Negeri Surabaya
Vocational Faculty,
D4 Mechanical Engineering Study Program**

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date		
Heat Transfer	99992140102022		T=2 P=0 ECTS=3.18	2	July 17, 2024		
AUTHORIZATION	SP Developer		Course Cluster Coordinator	Study Program Coordinator			
	Arya Mahendra Sakti, S.T., M.T.			
Learning model	Case Studies						
Program Learning Outcomes (PLO)	PLO study program which is charged to the course						
	Program Objectives (PO)						
	PLO-PO Matrix						
		<table border="1" style="margin: auto;"> <tr> <td style="width: 100px; height: 30px;">P.O</td> </tr> </table>					P.O
P.O							
Short Course Description	This course discusses the concepts of heat transfer, basic laws of heat transfer and their applications in the field of mechanical engineering, conduction heat transfer, convection heat transfer, radiation heat transfer, and heat exchangers.						
References	Main :						
	<ol style="list-style-type: none"> 1. Cengel, Y.A. 1998. Heat Transfer : A Practical Aproach. New York : Mc. Graw-Hill. 2. Holman, J.P. 1994. Perpindahan Kalor, Edisi Keenam, Alih Bahasa Ir. E. Jasjfi, Msc, Erlangga, Jakarta: Penerbit Erlangga. 3. Incropera, Frank P. dan Dewitt, David P. 2011. Fundamental of Heat and Mass Transfer. 7th Edition. John Wiley & Sons, Inc. 4. Modul Radiator Trainer. 5. Modul Oil Cooler Trainer. 6. Modul Wire and Tube Heat Exchanger. 						
	Supporters:						
Supporting lecturer	Diah Wulandari, 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 recognize heat transfer phenomena in the surrounding environment	Can explain examples of heat transfer events in everyday life	Criteria: 1) Can provide examples of heat transfer phenomena in the environment around each mode.	Lectures, discussions, questions and answers, exercises and assignments 5 X 20		0%
2	Able to master the basic laws of heat transfer.	Can explain heat and energy, heat and changes in temperature, heat and changes in the state of matter, how heat is transferred.	Criteria: 1) Can state the heat transfer formula for the 3 existing perpan modes.	Lectures, discussions, questions and answers, exercises and assignments 5 X 20		0%
3	Able to master conduction heat transfer	Can explain 1-D steady state conduction heat transfer.	Criteria: 1. Because it applies the 1 D conduction band concept so it does not experience losses in the form of conduction resistance	Lectures, discussions, questions and answers, exercises and 5 X 10 assignments		0%
4	Able to master conduction heat transfer (continued).	Can explain 2-D steady state conduction heat transfer.	Criteria: 1) Can provide examples of the application of 2-dimensional conduction heat transfer in the field of mechanical engineering	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20		0%
5	Able to master radiant heat transfer	Can explain physical mechanisms, radiation properties, radiation form factors, heat transfer between non-black bodies, radiation shielding.	Criteria: 1) Can describe the physical mechanism of radiation bandaging along with its formula	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20		0%
6	Able to master convection heat transfer.	Can explain the principles of convection.	Criteria: Describe the physical mechanism of convection panels along with the formula according to the module	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20		0%
7	Able to master convection heat transfer (continued).	Can explain forced and free convection.	Criteria: Can explain the differences in principle between forced and free convection sheets	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20		0%
8	UTS		Criteria: 1) Answers and criteria are attached	5 X 20		0%
9	Able to carry out forced convection experiments on a radiator trainer.	Can explain the types of heat exchangers.	Criteria: 1) Can mention the types of heat exchangers according to existing literature	Lectures, discussions, questions and answers, exercises and assignments. 5 X 1		0%

10	Able to carry out forced convection experiments on a radiator trainer.	Analyzing experimental results of variations in fluid mass flow rate in the radiator trainer.	Criteria: Can make practicum reports and analysis of experimental results of variations in fluid mass flow rate in the radiator trainer	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20			0%
11	Able to carry out forced convection experiments on a radiator trainer.	Analyze the experimental results of variations in temperature of the incoming fluid in the radiator trainer and analyze the experimental results of variations in the type of fluid filling the radiator in the radiator trainer.	Criteria: Can make a practical report on the effect of incoming fluid temperature on radiator capacity.	Lectures, discussions, questions and answers, exercises and assignments. 5 X 20			0%
12	Able to carry out forced convection heat transfer experiments on the Oil Cooler Trainer	Analyzing experimental results of variations in fluid mass flow rate in the oil cooler trainer.	Criteria: Can make a practicum report about the effect of fluid mass flow rate on oil cooler capacity	Lectures, discussions, questions and answers, exercises, and conducting 1 X 1 experiments			0%
13	Able to carry out forced convection experiments on the oil cooler trainer	Analyzing experimental results of fluid temperature variations in the oil cooler trainer.	Criteria: Can make practicum reports and analytical studies of forced convection experimental results on oil cooler trainers correctly according to literature studies	Lectures, discussions, questions and answers, exercises, and conducting 5 X 20 experiments			0%
14	Able to carry out free convection experiments on wire and tube heat exchangers.	Analyzing the results of free convection experiments on wire and tube heat exchangers.	Criteria: Can make practicum reports and analysis studies of experimental results of free convection on wire and tube heat exchangers correctly according to literature studies	Lectures, discussions, questions and answers, exercises, and conducting 5 X 20 experiments			0%
15	Able to review heat transfer journals	Able to study heat transfer journal articles (English)	Criteria: Obtain one perpan article according to the provisions and can present it in a class seminar (discussion)	Cooperative learning 5 X 20			0%
16	UAS		Criteria: Answers and criteria are attached	5 X 20			0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

Notes

- 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.
- 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.