



**Universitas Negeri Surabaya**  
**Faculty of Engineering,**  
**Mechanical Engineering Undergraduate Study Program**

**Document Code**

**SEMESTER LEARNING PLAN**

<b>Courses</b>	<b>CODE</b>	<b>Course Family</b>	<b>Credit Weight</b>		<b>SEMESTER</b>	<b>Compilation Date</b>	
Heat Transfer I	2120103064		T=3	P=0	ECTS=4.77	4 July 18, 2024	
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>		<b>Study Program Coordinator</b>		
	.....		.....		Ir. Priyo Heru Adiwibowo, S.T., M.T.		
<b>Learning model</b>	Case Studies						
<b>Program Learning Outcomes (PLO)</b>	PLO study program that is charged to the course						
	Program Objectives (PO)						
	PLO-PO Matrix						
		P.O					
<b>Short Course Description</b>	Provide understanding and insight to students regarding heat transfer conductors by conduction, convection and radiation, one-dimensional conduction heat transfer and two-dimensional conduction heat transfer for steady state conditions.						
	References						
<b>Supporting lecturer</b>	<b>Main :</b>						
	<ol style="list-style-type: none"> <li>1. P.Incropera, Frank &amp; Dewitt P.David, Fundamental of heat transfer , Fifth Edition, John Willey and Sons, Inc New York, 2002</li> <li>2. Bejan, A &amp; Kraus, Allan D, Heat Transfer Handbook ,John Willey and Sons, Inc New York,2003</li> <li>3. Cengel, Y. A., Heat and Mass Transfer: A Practical Approach , Third Edition, McGraw Hill Companies, 2006</li> <li>4. Bahan-bahan dari Internet dan kepustakaan lain</li> </ol>						
	<b>Supporters:</b>						
Prof. Dr. I Made Arsana, S.Pd., M.T. Ir. Priyo Heru Adiwibowo, 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	<b>Criteria:</b> Mention at least 1 example of the three heat transfer processes (convection, conduction and radiation)	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
2	Able to master the basic laws of heat transfer.	Can explain the three (3) basic laws of heat transfer and their interaction with energy.	<b>Criteria:</b> Can explain the definition of heat transfer mode along with the formula correctly according to the module or heat transfer reference book	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments	(3)		0%
3	Able to understand conduction heat transfer	Can explain the phenomenon of 1-D steady state conduction heat transfer.	<b>Criteria:</b> The answer is in the form of a 1 D conduction concept accompanied by a schematic image and formula	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
4	Able to understand conduction heat transfer (continued).	Can explain 2-D steady state conduction heat transfer.	<b>Criteria:</b> The answer is in the form of a 2D conduction concept accompanied by a schematic image and formula	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
5	Able to understand radiant heat transfer	Can explain physical mechanisms, radiation properties, radiation form factors, black body heat transfer.	<b>Criteria:</b> The answer is in the form of a radiation concept accompanied by a schematic image and formula	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
6	Able to understand forced convection heat transfer	Can explain the principles of forced convection	<b>Criteria:</b> The answer is in the form of the concept of forced convection accompanied by a schematic image and formula	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
7	Able to understand free convection heat transfer	Can explain free convection	<b>Criteria:</b> The answer is in the form of the concept of free convection accompanied by a schematic image and formula	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			0%
8	UTS	Can answer questions/questions about heat transfer according to the heat transfer book	<b>Criteria:</b> Can work according to the answer key = 100, if you can answer 50% answer key j = 50, P = ex	Paper based test 3 X 50			0%

9	Able to understand about heat exchangers.	Can explain the types of heat exchangers.	<b>Criteria:</b> At least mention 4 heat exchangers in the engineering field	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 3 X 50 assignments			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.	<b>Criteria:</b> Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 3 X 50			0%
11	Able to carry out forced convection experiments on a radiator trainer.	Analyze the experimental results of variations in fluid temperature entering the radiator trainer and analyze the experimental results of variations in the type of radiator fluid in the radiator trainer.	<b>Criteria:</b> Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 3 X 50			0%
12	Able to master the meaning of forced convection heat transfer on the Oil Cooler Trainer and able to carry out forced convection experiments on the oil cooler trainer.	Can state the names and functions of the Oil Cooler Trainer components and analyze the experimental results of variations in fluid mass flow rate in the oil cooler trainer.	<b>Criteria:</b> Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 3 X 50			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.	<b>Criteria:</b> Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 3 X 50			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.	<b>Criteria:</b> Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 3 X 50			0%
15	Review heat transfer material in published journals.	Can present material from reviews of published journals in the field of heat transfer	<b>Criteria:</b> Can present 1, 2 journals according to indicators. Can provide opinions or responses to journals being reviewed regarding content and development ideas.	Reading, Discussion and Presentation 3 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.