



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		
Heat Exchanger	2120102002		T=2 P=0 ECTS=3.18	6	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					
Short Course Description	Understanding and introduction to heat exchangers, classification and construction, types of shell and tubes heat exchangers, baffles, tube sheets, TEMA standards, bell method and kern method design procedures, applications and case studies.						
	References						
References	Main :						
	1. Arthur P.Fraas, 1989. Heat Exchanger Design , John Wiley and Sons, Inc. Buku Standard TEMAG.F. Hewitt, G.L. Shires, T.R. Bott, 1994. Process Heat Transfer, CRC Press, Inc. Bahan-bahan dari Internet dan kepustakaan lain						
Supporting lecturer	Supporters:						
	Prof. Dr. I Made Arsana, 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	Able to recognize heat transfer phenomena (heat exchanger applications) in the surrounding environment	Can explain examples of heat transfer events in everyday life	Criteria: 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 2 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.	Criteria: 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 2 X 50 assignments		0%
3	understand the definition of a heat exchanger	Explain the definition of a heat exchanger	Criteria: Answers are in accordance with the definitions in the module	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 2 X 50 assignments		0%
4	Understand the classification of heat exchangers	Mention the classification of heat exchangers	Criteria: Answers according to those in the module	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 2 X 50 assignments		0%
5	Understand the phenomenon of conduction - convection heat transfer	Explain the phenomenon of conduction-convection heat transfer	Criteria: Answers according to those in the module	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 2 X 50 assignments		0%
6	Understand design considerations in heat exchangers	Explain design considerations in designing heat exchangers	Criteria: Answers according to those in the module	Lectures, observations, discussions, questions and answers, exercises, scientific learning, and 2 X 50 assignments		0%
7	Understanding heat transfer in car radiators (extended surface heat exchanger)	Analyzing heat transfer in a car radiator	Criteria: Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 2 X 50		0%
8	UTS	Can answer questions/questions about heat exchangers according to the heat transfer book	Criteria: Answer according to the answer key	paper based test 2 X 50		0%

9	Understanding oil cooler (extended surface heat exchanger) heat transfer	Analyzing heat transfer in the oil cooler	Criteria: Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 2 X 50			0%
10	Carrying out heat transfer experiments on wire and tube heat exchangers (extended surface heat exchangers)	Analyzing heat transfer in wire and tube heat exchangers	Criteria: Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 2 X 50			0%
11	Understand heat transfer in shell and tube heat exchangers	Analyzing heat transfer in shell and tube heat exchangers	Criteria: Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 2 X 50			0%
12	Analyzing heat exchanger performance using the LMTD method	Analyzing heat exchanger performance using the LMTD method	Criteria: Answers according to those in the module	scientific learning 2 X 50			0%
13	Analyzing heat exchanger performance using the NTU-effectiveness method	Analyzing heat exchanger performance using the NTU-effectiveness method	Criteria: Answers according to those in the module	scientific learning 2 X 50			0%
14	Analyze radiator capacity	Analyze radiator capacity	Criteria: Report format: Title, objectives, tools and materials, theoretical study, work safety, work steps, practicum results data, data analysis, conclusions	scientific learning 2 X 50			0%
15	Review heat transfer material in published journals.	Analyzing heat transfer in heat exchangers	Criteria: Can present 1 journal and can provide opinions or responses to the journal being reviewed regarding content and development ideas.	Reading, Discussion and Presentation 2 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.