	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
Pumps & Compressors	2120103071		T=3	P=0	ECTS=4.77	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

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 application of a combination of basic courses in Thermodynamics and fluid mechanics which includes: introduction to the main components of centrifugal pumps, hydraulic principles in pumps, NPSH and cavitation, pump performance characteristic curves, pump selection, installation, operation and maintenance of pumps, main components and principles piston compressor work, analysis of piston compressors, main components and working principles of axial compressors and analysis of axial compressors
References	**Main :**

1. Indra Herlamba Siregar, 2014, Pompa Centrifugal, Unipress.
2. Igor J. Karrasik, 2001, Pump Handbook 3rd Edition, McGraw-Hill
3. Val S Lobanoff, 1992, CEntrifugal Pump 2nd Edition, Butterworth-Heinemman
4. Tony Giampallo, 2009, Compressor Handbook, CRC-Press

	Supporters:
Supporting lecturer	Indra Herlamba Siregar, 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	Students get a complete picture of the pump and compressor course and are able to identify the main components of a centrifugal pump	1. Students understand the material that will be presented in one semester for the pump and compressor course2. Students understand the main components of a centrifugal pump	**Criteria:** -	Lectures 3 X 50			0%
2	Students master the basic theory used to analyze important parameters of Centrifugal Pumps	Students are able to use equations that are used to analyze important parameters of Centrifugal Pumps		Lectures and discussions 3 X 50			0%
3	Students master the basic theory used to analyze important parameters of Centrifugal Pumps Students master the use of friction tables for pipes and accessories	Students are able to use equations that are used to analyze important parameters of Centrifugal Pumps. Students are able to use friction tables on pipes and accessories		Live Learning 6 X 50			0%
4	Students understand the phenomenon of cavitation. Students are able to calculate the NPSH of a pump. Students are able to plot the NPSH of a pump on a centrifugal pump performance graph.	1. Students understand the cavitation phenomenon and how to overcome it 2. Students are able to use Excel to calculate the NPSH of a pump 3. Students are able to plot the NPSH value of the pump on a centrifugal pump performance graph		Direct experience calculating the NPSH value of a pump from a condition and using it to graph the performance of a 3 X 50 centrifugal pump			0%
5	Students understand the PUMP PERFORMANCE CHARECTERISTIC CURVE	1. Students are able to sketch a PUMP PERFORMANCE CHARECTERISTIC CURVE arranged in parallel1. Students are able to sketch a PUMP PERFORMANCE CHARECTERISTIC CURVE arranged in a series		Direct learning 3 X 50			0%
6	Students understand the PUMP PERFORMANCE CHARECTERISTIC CURVE	1. Students are able to sketch a PUMP PERFORMANCE CHARECTERISTIC CURVE arranged in parallel1. Students are able to sketch a PUMP PERFORMANCE CHARECTERISTIC CURVE arranged in a series		Direct learning 3 X 50			0%
7	Students are able to select pumps	Students are able to do calculations to choose a pump		Direct learning 3 X 50			0%
8	Students understand the principles of correct pump installation and maintenance	Students are able to explain the principles of correct pump installation. Students have knowledge of correct pump maintenance		Live Learning 3 X 50			0%
9	Students achieve 75% learning completeness			3 X 50			0%
10	Students are able to analyze the power requirements of reciprocating compressors	1. Students understand the working principle of reciprocating compressors		Direct learning 3 X 50			0%

11	Students are able to analyze the power requirements of reciprocating compressors	Students are able to use equations used to analyze reciprocating compressor power requirements		Direct learning 3 X 50			0%
12	Students are able to analyze the power requirements of reciprocating compressors	1. Students are able to use the equations used to analyze reciprocating compressor power requirements		Direct learning 3 X 50			0%
13	Students are able to analyze the power requirements of axial compressors	1. Students understand the working principles of axial compressors		Direct learning 3 X 50			0%
14	Students are able to analyze the power requirements of axial compressors	1. Students are able to use the equations used to analyze axial compressor power requirements2. Students are able to use the speed triangle which is used to analyze axial compressor power requirements		Direct learning 3 X 50			0%
15	Students are able to analyze the power requirements of axial compressors	1. Students are able to use the equations used to analyze axial compressor power requirements2. Students are able to use the speed triangle which is used to analyze axial compressor power requirements		Direct learning 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.