	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
Fluid Mechanics 2	2120102127		T=2	P=0	ECTS=3.18	4	July 16, 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	Understanding of dimensional analysis, general characteristics of external flow, drag and lift phenomena on an object in relation to fluid flow, boundary layer theory, conservation principles in fluid flow, and basic theory regarding velocity triangle fluid machines.
References	**Main :**

1. [1]. Robert W.Fox, Alan T. McDonald, Philip J. Pritchard. 2004. Introduction to Fluid Mechanics, 6th Edition. USA: John Wiley & Sons, Inc.
2. [2]. Y. Nakayama & R.F. Boucher. 2002. Introduction to Fluid Mechanics, Revised. Oxford: Butterworth-Heinemann.
3. [3]. Herbert Oertel. 2001. Introduction to Fluid Mechanics: Fundamentals & Applications Braunschweig-Wiesbaden

	Supporters:
Supporting lecturer	Prof. Dr. Ir. I Wayan Susila, M.T. Dr. A. Grummy Wailanduw, M.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	Students can find out the material that will be studied in the Fluid Mechanics 2 course, and lecture contracts such as: rules and regulations, and assessments	Can understand the material that will be studied in the Fluid Mechanics 2 course, and lecture contracts such as: rules and assessment	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result 5.USS and USf: 6.Compliance with the answer key, including: work steps, completeness of work, and final results	Lectures and questions and answers 3 X 50			0%
2	Students can explain ideal fluid analysis: Euler‘s equation, Bernoulli‘s equation, energy grade line (EGL) and hydraulic grade line	Can explain ideal fluid analysis: Euler‘s equation, Bernoulli‘s equation, energy grade line (EGL) and hydraulic grade line	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
3	Students can explain ideal fluid analysis: Euler‘s equation, Bernoulli‘s equation, energy grade line (EGL) and hydraulic grade line	Can explain ideal fluid analysis: Euler‘s equation, Bernoulli‘s equation, energy grade line (EGL) and hydraulic grade line	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
4	Students can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	Can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
5	Students can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	Can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
6	Students can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	Can explain dimensional analysis (pi-Buckingham theorem), dimensionless parameters, and similarity	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%

7	Students can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	Can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
8	Students can work on USS questions	Can do USS questions	**Criteria:** 1.Writing test: 2.Compliance with the answer key, including: work steps, completeness of work, and final results	Open book 2 X 50			0%
9	Students can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	Can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
10	Students can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	Can explain viscous fluid flow in channels: laminar flow, turbulent flow, fully developed flow, Moody diagram, minor losses & major losses	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
11	Students can explain external flow including the characteristics of the boundary layer, lift and drag	Can explain external flow including boundary layer characteristics, lift and drag	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
12	Students can explain external flow including the characteristics of the boundary layer, lift and drag	Can explain external flow including boundary layer characteristics, lift and drag	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
13	Students can explain external flow including the characteristics of the boundary layer, lift and drag	Can explain external flow including boundary layer characteristics, lift and drag	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%

14	Students can explain about compressible flow including ideal gases, Mach number and speed of sound, isentropic and non-isentropic flow	Can explain compressible flow including ideal gas, Mach number and speed of sound, isentropic and non-isentropic flow	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
15	Students can explain about compressible flow including ideal gases, Mach number and speed of sound, isentropic and non-isentropic flow	Can explain compressible flow including ideal gas, Mach number and speed of sound, isentropic and non-isentropic flow	**Criteria:** 1.Task: 2.a. Steps for working on the questions 3.b. Completeness of work: Drawings/schemes, basic formulas, assumptions, inclusion of units 4.c. The final result	Lectures, questions and answers, discussions and practice questions on 3 X 50			0%
16	Students can work on US questions	Can do US questions	**Criteria:** 1.Subjective test: 2.Compliance with the answer key, including: work steps, completeness of work, and final results	Open book 2 X 50			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.