	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 I	2120103041		T=3	P=0	ECTS=4.77	4	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	Fluid Mechanics 1 is a mandatory course that studies the behavior of fluids at rest or in motion without paying attention to the causes of fluid motion. The science of fluid mechanics is the main key in mechanical engineering, therefore its status in the curriculum is a mandatory course for Mechanical Engineering students. In the study of Mechanical Engineering, this course is very helpful in the basics of planning design, design of machines, airplanes, ships as well as supporting problem solving analysis of thermodynamics, heat transfer and combustion theory courses, especially those related to the conservation and exploitation of energy sources . This course is mainly based on the Physics course which is mostly related to natural sciences. In the Fluid Mechanics 1 course, the basic concepts of fluid mechanics will be discussed, including fluid properties, the forces that occur in static and dynamic fluids. After taking this course, students are expected to understand the concepts of fluid mechanics and their interrelationships and be able to apply them to the field of Mechanical Engineering.
References	**Main :**

1. Robert W Fox., Alant. MC Donald. Introduction To Fluid Mechanics.
2. Frank M.White. Mekanika Fluida I Dan II.
3. Philip M. Gerhart and Richard J.Gross. Fluid Mechanics.
4. Succter V.L. Mekanika Fluida. Erlangga: Jakarta.
5. Shannes L.H. Mechanics of Fluids, Mc Graw-Hill, New York
6. Merle .C. Potter, David C. Wiggret. Schaums Outline Mekanika fluida. Erlangga

	Supporters:
Supporting lecturer	DWI HERU SUTJAHJO 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	Formulate fluid properties	1.1 Able to understand and explain the physical meaning of dimensions, units and physical quantities 1.2 Able to convert one quantity and unit to another, practice questions. 2.1 Able to analyze and calculate fluid properties and their relationship with thermodynamics, practice questions	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations Reading literature, counting case examples, peer discussion, and Q&A Reading literature, counting case examples, peer discussion, and Q&A 10 X 20			0%
2							0%
3	Understand and analyze fundamental concepts of fluid mechanics related to fluid properties and their influence on fluid mechanics applications.	3.1 Able to understand the basic concept of fluid as a continuum 3.2 Able to explain and analyze velocity profiles in steady, unsteady fluids, as well as velocity profiles in fluids in 1D, 2D and 3D flow	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations Reading literature and listening to students' explanations 10 X 10			0%
4	Describe the types of flow lines	4.1 Able to understand and differentiate the types of flow lines timelines, pathlines, streaklines, streamlines)	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations 10 X 10			0%
5	Understand and analyze the concept of viscosity in a flow	5.1 Able to understand and explain the difference between viscosity in Newtonian fluids and viscosity in non-Newtonian fluids 5.2 Able to describe and analyze stress profiles and surface tension in a fluid	**Criteria:** Attendance, activeness in questions and answers, seriousness in attending lectures, according to scoring guidelines and presentation rubrics. Full marks are obtained if you do all the questions correctly. Full marks are obtained if you do all the questions correctly.	Reading literature, counting case examples, peer discussion, and Q&A Reading literature, counting case examples, peer discussion, and Q&A 10 X 10			0%
6	Describe and	6.1 Able to understand, describe and classify viscous and inviscid flow 6.2 Able to understand, describe and classify laminar flow and turbulent flow 7.1 Able to identify and classify compressible flow and incompressible flow 7.2 Able to describe and differentiate internal flow and external flow	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	given different case studies for their groups, each group must work together to analyze, calculate, and complete the case studies. 10 X 20			0%

7							0%
8	UTS Midterm Exam	null	**Criteria:** null	null 10 X 10			0%
9	Understand the basic concepts of static fluids	9.1 Able to understand the basic equations of static fluids 9.2 Able to understand the atmospheric standards used in the concept of static fluids	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature, counting case examples, peer discussions, and 10 X 10 questions and answers			0%
10	Understand and analyze pressure variations in static fluids	10.1 Able to analyze variations in static fluid pressure in incompressible liquids: manometer 10.2 Able to analyze variations in static fluid pressure in gas fluids	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature, counting case examples, peer discussions, and peer discussion questions and answers, various forms of static fluids and 10 X 10 Questions and Answers			0%
11	Analyze and formulate hydrostatic forces	11.1 Able to analyze and formulate hydrostatic forces on the surface of submerged objects and their problem applications 11.2 Able to analyze and formulate hydrostatic forces on submerged surfaces and their problem applications 12.1 Able to analyze and formulate hydrostatic forces on curved surface submerged objects and their problem applications	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	- Reading literature, listening to student explanations, counting case examples, peer discussion, and Q&A - peer discussion, and Q&A 10 X 20			0%
12							0%
13	Understand basic concepts and analyze bouyancy and stability styles	13.1 Able to understand basic concepts and analyze buying and stability styles	**Criteria:** In accordance with the scoring guidelines and presentation rubric, full marks are obtained if you do all the questions correctly, full marks are obtained if you do all the questions correctly, attendance and assignments given to each group/independent written test, oral test, sub-summative exam, summative exam.	Reading literature, counting examples of peer discussion, and 10 X 10 questions and answers			0%

14	Analyze and formulate basic integral equations for volume control: fluid dynamics	14.1 Able to understand the basic laws of systems (mass conservation, Newton's 2nd law, angular momentum principle, 1st and 2nd laws of thermodynamics 14.2 Able to analyze and solve applications of mass conservation problems	**Criteria:** In accordance with the scoring guidelines and presentation rubric, full marks are obtained if you do all the questions correctly, full marks are obtained if you do all the questions correctly, attendance and assignments given to each group/independent written test, oral test, sub-summative exam, summative exam.	Reading literature, counting case examples, peer discussions, and 10 X 10 questions and answers			0%
15	Analyze and formulate momentum equations in volume control: fluid dynamics	15.1 Analyze and formulate the momentum equation in dynamic fluid volume control 15.2 Able to analyze and solve the application of momentum equation problems in dynamic fluid volume control	**Criteria:** Assessment of the level of student participation in terms of attendance/lectures, practice, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations.	Reading literature and listening to students' explanations Reading literature, counting case examples, peer discussions, and questions and answers 10 X 10			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.