



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
Advanced Fluid Mechanics	2120102044		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 of boundary layer theory, compressible fluid flow through the Throat, Mach number, objects in fluid flow, shear and lift forces, momentum and energy equations, basic theory of fluid machines. Turbine; change of pressure into velocity; pump and compressor characteristics, head opening theory, speed diagrams and characteristics.						
	References						
References	Main :						
	1. Robert W. Fox, and Alan T. McDonald. 1998. <i>Introduction to Fluid Mechanics</i> , Fifth Edition, John Wiley & Sons Inc., New York. Munson, B.R., Young, D.F., dan Okiishi, T.H., 1998. <i>Fundamentals of Fluid Mechanics</i> , Edisi ke-3, John Wiley & Sons. Bahan-bahan dari Internet dan kepustakaan lain						
	Supporters:						
Supporting lecturer	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	Deriving Bernoulli's equation and its applications	1.1 Able to derive Bernoulli's equation and understand this equation. 1.2 Be able to apply Bernoulli's equation in everyday life	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, studying example questions, peer discussions, and asking questions. Doing practice questions at home and working in groups with fellow students. 2 X 50			0%
2	Deriving Bernoulli's equation and its applications	2.1 Able to work on and complete 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, studying example questions, peer discussions, and asking questions. Doing practice questions at home and working in groups with fellow students. 2 X 50			0%
3	Understand and analyze static, stagnation, and dynamic pressure.	3.1 Able to understand the basic concepts of static, stagnation and dynamic pressure 3.2 Able to explain and how to measure static, stagnation and dynamic pressure	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 lecturers' explanations during lectures Students ask about things that are not clear or cannot be understood 2 X 50			0%
4	Dimensional and similarity analysis. This material is very useful for laboratory workers.	4.1 Able to carry out dimensional and similarity analysis	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 lecturers' explanations 2 X 50			0%
5	Dimensional and similarity analysis. This material is very useful for laboratory workers	5.1 Able to carry out dimensional and similarity analysis	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 lecturers' explanations 2 X 50			0%

6	Incompressible viscous flow	6.1 Able to understand, describe and classify internal and external viscous and inviscid flow 6.2 Able to understand, describe and classify laminar flow and turbulent 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. 2 X 50			0%
7	Incompressible viscous 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. 2 X 50			0%
8	UTS (Sub Summative)	UTS (Sub Summative)	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.	UTS (Sub Summative) 2 X 50			0%
9	Flow characteristics in the pipe	9.1 Able to understand the characteristics of flow in pipes 9.2 Able to understand various types of flow losses in pipes	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 2 X 50 questions and answers			0%
10	Flow characteristics in the pipe	10. General solutions to flow problems in pipes	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 2 X 50 questions and answers			0%
11	Flow characteristics in the pipe	11. Application of energy equations to flow in pipes	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 2 X 50 questions and answers			0%

12	Boundary Layers	12.1 Able to understand and comprehend the existence of boundary layers in flow over flat plates or in pipes. 12.2 is able to calculate the thickness of the boundary layer and the influence of the existence of the boundary layer.	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 2 X 50			0%
13	Boundary Layers	13.1 Able to calculate the magnitude of the pushing force (drag force) 13.2 Able to calculate the magnitude of the lifting force (lift force)	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 2 X 50			0%
14	Introduction to compressible flow	14.1 Able to understand basic concepts and analyze compressible flow	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 asking questions 2 X 50			0%
15	One-dimensional compressible flow	15.1 Able to understand the characteristics of compressible flow. 15.2 Able to analyze and solve isentropic flow	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 2 X 50 questions and answers			0%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

Notes

- 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.
- 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.
- 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.
- 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.