



MODULE HAND BOOK

MECHANICAL ENGINEERING VOCATIONAL EDUCATION STUDY PROGRAM

FACULTY OF ENGINEERING – UNIVERSITAS NEGERI PADANG

COURSE NAME	CODE	Course classification	CU		Sem	Version
			Theory	Pract		
Fluid Mechanics	MES1.61.3103	Study Program Compulsory Courses/ Basic science	2	0	3	1
Responsible	Dr. Remon Lapisa, M.Sc and Andre Kurniawan, MT			Signature		
INFORMATION	Dean		Head of Department		Coordinator of study program	
	<u>Dr. Fahmi Rizal, M.Pd., MT</u> NIP. 195912041985031004		<u>Drs. Purwantono, M.Pd</u> NIP. 196308041986031002		<u>Drs. Purwantono, M.Pd</u> NIP. 196308041986031002	
Program Learning Outcomes	Program Learning Outcomes (PLO): <ol style="list-style-type: none"> 1. Possess a good ability to apply the basic science (mathematics and natural sciences) and other disciplines in profesional jobs / projects (Knowledge-understanding) <ol style="list-style-type: none"> 1.1. possess a good understanding and can apply the basic concept of mathematics to solve various technical problems 1.2. possess a good understanding and can apply basic the concept of physic to solve various technical problems 1.3. possess a good understanding and can apply basic the concept of chemistry to solve various technical problems 2. Possess a critical and creative thingking in identifying, formulating, problem solving and evaluating various problems in mechanical engineering using the most appropriate and effective scientific method (Engineering analysis, investigations and assessment): <ol style="list-style-type: none"> 2.1. problem identification skills 2.2. problem analysis skills 2.3. problem evaluation skills 3. Possess a good ability in designing, manufacturing and operating machines (Engineering design) <ol style="list-style-type: none"> 3.1. able to formulate ideas/concepts into a technical drawing, design and budget plans 					

- 3.2. able to operate various machines and other engineering equipment with the correct standard operating procedure
- 3.3. able to design a machine or machinery system based on a valid scientific theory
- 3.4. able to realize a concept/design into a prototype, manufacturing process and engineering system
- 4. Possess a good ability to design, organize and evaluate the education and learning process in mechanical engineering vocational education. (Education design)
 - 4.1. able to design curriculum and learning process by considering various aspects
 - 4.2. able to organize, control, evaluate and improve the quality of the learning process
 - 4.3. able to develop an interesting, effective and efficient learning medias
- 5. Possess a good ability to adapt to development in science and technology and apply it into professional jobs by considering any non-technical aspects. (Engineering practice)
 - 5.1. able to innovate and develop technology in the field of mechanical engineering by considering social, economic and environmental aspects
 - 5.2. able to carry out the optimization process and increase the efficiency of machines or machining system.
 - 5.3. able to improve the performance of machine/ machinery system by applying the information technology
- 6. Possess a good softskil and spirit of lifelong learning (Transferable skill / softskill)
 - 6.1. possess a religious character
 - 6.2. possess a spirit of nasionalisme, social sensitivity and environmental consevation orientation
 - 6.3. possess the ability to communicate effectively and work together in teamwork
 - 6.4. possess the ability to transfer science and technology to society to improve the quality of life
 - 6.5. possess a good characters of entrepreneur

Course Learning Outcomes

Course Learning Outcomes (CLO)

CLO	PLO
1. Be able to explain the basic concepts of fluid mechanics: fluid properties, fluid statics, fluid kinematics and fluid dynamics.	1.1, 1.2., 1.3
2. Able to analyze the balance of objects submerged in fluid	1, .2, 2.1, 2.2, 2.3
3. Be able to explain momentum analysis in a flow system	1, .2, 2.1, 2.2, 2.3
4. Able to analyze flow in closed and open channels	1, .2, 2.1, 2.2, 2.3
5. Be able to explain the types and analysis of how fluid engines work (turbomachinery) such as turbines and pumps	1, .2, 2.1, 2.2, 2.3
6. Able to design simple equipment that uses the basic principles of fluid mechanics, either independently or in groups	1, .2, 2.1, 2.2, 2.3

Course descriptions	This course discusses the basic knowledge of fluid mechanics related to fluid properties, fluid dynamics and statics, flow in closed and open channels, fluid machines etc. along with their application in the field of mechanical engineering.	
References	Main references (RU):	
	1. Yunus A Cengel and JM Cimbala, "Fluid Mechanics: Fundamental and applications", 2nd Edition, Mc.Graw-Hills, 2014 2. White F. M, 'Fluid Mechanics', Mc. Graw-Hill, 1998	
	Support references (RP)	
Learning Media	Software:	Hardware:
		Computer, LCD Projector and Whiteboard and peripherals
Team Teaching		
Assessment	Mid-Term Exam, Final Exam, Independent & group assignments, Group presentations	
Requirements Subject	There is no	

COURSE SUBJECTS

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(1)	CLO-1.1: [PLO-1.2] Students are able to explain the basic concepts of fluid mechanics	Definition of fluids, applications in various fields, history of fluids, classification of fluids, systems and volume control, dimensions and units	Material explanation [1x70 ' Question and answer [1x10 ' Discussion [1x20 '	Make a summary and description of the material presented in the resume book	Able to explain the basic concepts of fluid mechanics and their applications in various fields	RU-1
(2)	CLO-1.2: [PLO-1.2] Students are able to explain fluid	Fluid properties: Density, specific gravity, Ideal gas density, Energy and	Material review by students [3x3 '= 9'] Material explanation [1x60 '	<ul style="list-style-type: none"> Make a summary and description of the material 	Be able to explain various characteristics fluid	RU-1 and RU-2

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	characteristics	specific heats, Compressibility, Viscosity, Surface tension and Capillarity	Question and answer [1x20 '] Discussion [1x10 ']	presented in the resume book <ul style="list-style-type: none"> Group discussion on fluid characteristics 		
(3)	CLO-1.3: [PLO-1.2] Students are able to explain the concepts of pressure and fluid statics-1	The concept of pressure, pressure variation with depth, manometer, pressure gauge	Material review by students [3x3 '= 9'] Material explanation [1x70 '] Question and answer [1x21 ']	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Homework assignments 	Able to explain the concept of pressure and fluid statics	RU-1 and RU-2, RP-1
(4)	CLO-1.4: [PLO-1.2] Students are able to explain the concept of pressure and fluid statics-2	The concept of static and hydrostatic fluids	Material review by students [3x3 '= 9'] Material explanation [1x70 '] Question and answer [1x21 ']	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Homework assignments 	Be able to explain the basic concept of static and hydrostatic fluids	RU-1 and RU-2,
(5)	CLO-1.5: [PLO-1.2] Students are able to explain fluid kinematics analysis	Fluid acceleration, streamlines, stream tubes, types of fluid movement and deformation, vorticity and rotationality	Material review by students [3x3 '= 9'] Material explanation [1x60 '] Question and answer [1x10 '] The task of doing practice questions [1x21 ']	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book The task of working on problems in class 	Be able to explain about the concepts of fluid dynamics and fluid kinematics	RU-1 and RU-2
(6)	CLO-2: [PLO-1.2, 2.1, 2.2] Students are able to explain the concept of balance of objects in fluid	Crochet object, Floating object, relative balance, fluid in equation	Material review by students [3x3 '= 9'] Material explanation [1x61 '] Question and answer [1x20 ']	Make a summary and description of the material presented in the	Be able to explain The basic concept of the balance of objects in fluids in	RU-1 and RU-2

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
				resume book	submerged and floating conditions	
(7)	CLO-1.6: [PLO-1.2] Students are able to explain the concept of the energy equation and the Bernoulli mass equation	Conservation of mass and energy in fluids, fluid mechanical energy and efficiency, Bernoulli equations	Material explanation [1x60'] Question and answer [1x10'] Discussion [1x30']	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book The task of making a summary of scientific articles at home 	Be able to explain the concept of the energy equation and the mass equation Bernoulli	RU-1 and RU-2
(8)	Mid-Test (UTS)					
(9)	CLO-3.1: [CP-2.1, 2.2, 2.3] Students are able to explain the concept of momentum analysis in the flow system	The types of forces and moments acting on volume control, volume control analysis calculates the flow force,	Material explanation [1x70'] Questions and answers and discussion [1x30']	Make a summary and description of the material presented in the resume book	Be able to explain Basics of momentum analysis in flow systems	RU-1 and RU-2 RP-1 and RP-2
(10)	CLO-4.1: [CP-2.1, 2.2, 2.3] Students are able to explain the concept of fluid flow in pipes (closed channel)	Concept of laminar and turbulent flow in pipes, Reynold number, Pressure drop and head loss, Flow in noncircular pipes	Material explanation [1x70'] Questions and answers and discussion [1x30']	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Doing weekly chores at home 	Be able to explain Striling Cycle, Brayton Cycle, Brayton Cycle with Regeneration, Intercooling, Jet Propulsion Cycle, Turbojet Engine	RU-1 and RU-2 RP-1 and RP-2
(11)	CLO-4.2: [CP-2.1, 2.2, 2.3] Students are able to explain the concept of	Open channel classification, Non-uniform uniform flow, Laminar / turbolen open tub, Froude	Material review by students [3x3 '= 9'] Material explanation [1x70'] Question and answer [1x21]	<ul style="list-style-type: none"> Make a summary and description of the material presented in the 	Able to master the basic concepts of fluid flow in open channels (open	RU-1 and RU-2 RP-1

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	flow in an open channel (open channel)	number and wave speed, Specific energy	']	resume book • Doing weekly chores at home	channel)	
(12)	CLO-3.2: [CP-2.1, 2.2, 2.3] Students are able to understand the basic concepts of fluid flow through objects: Drag and Lift	The concept of flow around objects, Drag and lift, Drag coefficient, Parallel flow between plates	Material review by students [3x3 '= 9'] Material explanation [1x70 '] Discussion and questions and answers [1x21 ']	Make a summary and description of the material presented in the resume book	Able to master the basic concepts of fluid flow through objects: Drag and Lift	RU-1 and RU-2
(13)	CLO-5: [PLO-2.1, 2.2, 2.3] Students are able to explain the basic concepts of various fluid machines (turbomechinery)	Types and operation of pumps and turbines, dimensional analysis and performance of pumps and turbines	Material review by students [3x3 '= 9'] Material explanation [1x70 '] Discussion and questions and answers [1x21 ']	• Make a summary and description of the material presented in the resume book	Able to analyze the performance and dimensions of pumps and turbines	RU-1 and RU-2 RP-1
(14)	CLO-6: [PLO-2.2, 3.1,, 3.4, 6.3] Group presentation - 1 fluid mechanics equipment design made	Designing a mini project of an equipment system that uses the basic concepts of fluid mechanics	Group percentage [1x80 '] Question and answer [1x10 '] Conclusions and discussion highlights [1x10 ']	Individual / group presentations on designed equipment (1st, 2nd and 3rd presenter)	Capable megAnalyze and design simple equipment using fluid mechanics concepts	RU-1 and RU-2
(15)	CLO-6: [PLO-2.2, 3.1,, 3.4, 6.3] Group presentation - 2 fluid mechanics equipment designs made	Designing a mini project of an equipment system that uses the basic concepts of fluid mechanics	Group percentage [1x80 '] Question and answer [1x10 '] Conclusions and discussion highlights [1x10 ']	Individual / group presentations on designed equipment (4th, 5th and 6th presenter)	Capable megAnalyze and design simple equipment using fluid mechanics concepts	RU-1 and RU-2
(16)	Final Test (UAS)					

Note : 1 credit = (50 'TM + 60' BT + 60 'BM) / Week
 TM = Face to Face (Lecture)
 BT = Structured Learning.
 BM = Independent Study
 PS = Simulation Practicum (160 minutes / week)
 PL = Laboratory Practicum (160 minutes / week)

T = Theory (aspects of science)
 P = Practice (aspects of work skills)

Correlation between CLO and PLO and assessment methods

MSN1.62.4007	Assessment	Point (%)	PLO-1			PLO-2			PLO-3				PLO-4			PLO-5			PLO-6					
			1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2	3	4	5	
CLO-1.1	UTS. 1	3		V																				
CLO-1.2	UTS. 2	4		V																				
CLO-1.3	UTS. 3	4		V																				
CLO-1.4	UTS. 4	6		V																				
CLO-1.5	UTS. 5	3		V																				
CLO-2	UTS. 6	7.5		V		V	V																	
CLO-1.6	UTS. 7	7.5		V																				
CLO-3.1	UAS. 1	5				V	V	V																
CLO-4.1	UAS. 2	7.5				V	V	V																
CLO-4.2	UAS. 3	7.5				V	V	V																
CLO-3.2	UAS. 4	7.5				V	V	V																
CLO-5	UAS. 5	7.5				V	V	V																
CLO-6	Working Papers and Presentations	30					V		V			V											V	
CLO-6																								
TOTAL		100																						

Assessment Component

- Midterm exam (UTS) : 35%
- Final exams (UAS) : 35%
- Assignment : 20%
- Presence : 10%

Scoring/Grading level description

	Excellent	Good	Satisfy	Fail
ability to describe	Able to describe correctly and completely	Able to describe correctly but not complete	Able to describe but less clear and incomplete	Unable to describe
ability to formulate	Able to formulate correctly and completely	Able to formulate correctly but not complete	Able to formulate but less clear and incomplete	Unable to formulate
ability to calculate	Able to calculate correctly and completely	Able to calculate correctly but not complete	Able to calculate but less clear and incomplete	Unable to calculate
ability to analyze	Able to analyze correctly and completely	Able to analyze correctly but not complete	Able to analyze but less clear and incomplete	Unable to analyze

Scoring and grading system

Score	Quality	Quality score	Designation	Score	Quality	Quality score	Designation
85 – 100	A	4.0	Outstanding	55 – 59	C	2.0	Acceptable
80 – 84	A-	3.6	Excellent	50 – 54	C-	1.6	Poor
75 – 79	B+	3.3	Very good	40 – 49	D	1.0	Poor
70 – 74	B	3.0	Good	≤ 39	E	0.0	Fail
65 – 69	B-	2.6	Good	-	T	-	Postpone
60 – 64	C+	2.3	Acceptable				

