



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		
Factory layout	MES1.61.5102	Study Program Compulsory Courses/ MEVE core course	1	1	5	1
Responsible	Dr. Arwizet K, ST., MT and Drs. Muh. Taufik Pinat, MDP			Signature		
<u>INFORMATION</u>	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 Outcome	Program learning outcome of Mechanical engineering vocational education:					
	<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 thinking in identifying, formulating, problem solving and evaluating various problems in mechanical engineering using the most appropriate and effective scientific method (<i>Engineering analysis, investigations and assessment</i>): <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**)
 - 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																							
Course descriptions	This subject provides knowledge on designing facilities / facilities design. Facilities Design itself consists of allocating the plant (plant location) and designing the building (building design) where as it is known that the plant layout and material handling are closely related.																							
References	<table border="1"> <thead> <tr> <th data-bbox="479 729 1751 762"> CLO </th> <th data-bbox="1751 729 2101 762"> PLO </th> </tr> </thead> <tbody> <tr> <td data-bbox="479 762 1751 796"> 1. Understand the definitions and basic concepts of Installation Design </td> <td data-bbox="1751 762 2101 796"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> <tr> <td data-bbox="479 796 1751 829"> 2. Knowing how to determine the exact factory location and factory building shape </td> <td data-bbox="1751 796 2101 829"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> <tr> <td data-bbox="479 829 1751 863"> 3. Able to explain plant design activities and the required data </td> <td data-bbox="1751 829 2101 863"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> <tr> <td data-bbox="479 863 1751 912"> 4. Able to design the flow of materials / work stations and determine the relationship between work stations </td> <td data-bbox="1751 863 2101 912"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> <tr> <td data-bbox="479 912 1751 946"> 5. Knowing the factory layout and floor area of the factory </td> <td data-bbox="1751 912 2101 946"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> <tr> <td data-bbox="479 946 1751 995"> 6. Able to mention the type and function of moving materials, selecting material handling equipment and supporting equipment in the factory </td> <td data-bbox="1751 946 2101 995"> 2.1,2.2,2.3, 3.2, 5.2 </td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="479 1002 967 1035"> Main Reference (RU): </th> </tr> </thead> <tbody> <tr> <td data-bbox="479 1035 2101 1069"> 1. Apple, JM, (1990). Factory Layout and Material Transfer. John Willey & Sons, Inc: USA. (Translator Mardiono, NMT et al, ITB-Bandung third edition) ISBN 979-8001-4-3-5 </td> </tr> <tr> <td data-bbox="479 1069 2101 1102"> 2. Naibalo, C., (1985). Factory Engineering in an Industrial Management System. Jakarta: Akademi Pressindo CV </td> </tr> <tr> <td data-bbox="479 1102 2101 1136"> 3. Pinat, MT, (1999). Factory Installation Planning Textbook. FT UNP, DIP Padang State University: Padang. </td> </tr> <tr> <td data-bbox="479 1136 2101 1169"> 4. Purba, Radiks, (1997). Cost and Benefit Analysis. Jakarta: Rineka Cipta Publisher. </td> </tr> </tbody> <thead> <tr> <th data-bbox="479 1169 967 1203"> Additional Reference (RP) </th> </tr> </thead> <tbody> <tr> <td data-bbox="479 1203 2101 1236"> 1. Priyono, (1995). Project Administration. Yogyakarta: Publisher Andi Offset. Satalaksana, ZI, (1979). Engineering Procedures. Department of Industrial Engineering-ITB: Bandung. </td> </tr> <tr> <td data-bbox="479 1236 2101 1270"> 2. Wignjosoebroto, SP, (1993). Introduction to Industrial Engineering. Jakarta: Guna Widya Publisher. </td> </tr> </tbody> </table>		CLO	PLO	1. Understand the definitions and basic concepts of Installation Design	2.1,2.2,2.3, 3.2, 5.2	2. Knowing how to determine the exact factory location and factory building shape	2.1,2.2,2.3, 3.2, 5.2	3. Able to explain plant design activities and the required data	2.1,2.2,2.3, 3.2, 5.2	4. Able to design the flow of materials / work stations and determine the relationship between work stations	2.1,2.2,2.3, 3.2, 5.2	5. Knowing the factory layout and floor area of the factory	2.1,2.2,2.3, 3.2, 5.2	6. Able to mention the type and function of moving materials, selecting material handling equipment and supporting equipment in the factory	2.1,2.2,2.3, 3.2, 5.2	Main Reference (RU):	1. Apple, JM, (1990). Factory Layout and Material Transfer. John Willey & Sons, Inc: USA. (Translator Mardiono, NMT et al, ITB-Bandung third edition) ISBN 979-8001-4-3-5	2. Naibalo, C., (1985). Factory Engineering in an Industrial Management System. Jakarta: Akademi Pressindo CV	3. Pinat, MT, (1999). Factory Installation Planning Textbook. FT UNP, DIP Padang State University: Padang.	4. Purba, Radiks, (1997). Cost and Benefit Analysis. Jakarta: Rineka Cipta Publisher.	Additional Reference (RP)	1. Priyono, (1995). Project Administration. Yogyakarta: Publisher Andi Offset. Satalaksana, ZI, (1979). Engineering Procedures. Department of Industrial Engineering-ITB: Bandung.	2. Wignjosoebroto, SP, (1993). Introduction to Industrial Engineering. Jakarta: Guna Widya Publisher.
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Learning Media	Software:	Hardware: Computer, LCD Projector and Whiteboard and peripherals																						
Team Teaching																								
Assessment	Mid-Test Exam, Final Exam, Independent & group assignments, Group presentations																							
Requirements Subject	NO																							

Course Objects

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(1)	CLO-1: (PLO-1.2, 2.1) Students are able to explain basic concept of factory installation design	<ul style="list-style-type: none"> • Definition / understanding of Factory Installation Planning • Basic Concept of Factory Design 	Material explanation [1x75 ' Question and answer [1x10 ' Discussion [1x15 '	Make a summary and description of the material presented in the resume book	Able to explain the basic concepts of factory installation design	RU-1, RU-2, RU-3 and RU-4
(2)	CLO-2: [PLO-2.1,2.2,2.3] Students are capable Determine the factory place, factory building, explain the factory design activities	<ul style="list-style-type: none"> • Planning determinants • Determine the factory location • Determine the factory building • Describe the plant design activities 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book • Task work on questions 	Able Determine the factory place, factory building describes the plant design activities	RU-1, RU-2, RU-3 and RU-4
(3)	CLO-3: [PLO-1.1, 2.1, 2.2, 2.3, 3.4, 5.2] Students are capable State the data needed for plant installation planning, product analysis, process analysis	<ul style="list-style-type: none"> • Product Analysis • Process Analysis • Process Design Basics • Process Design Methodology 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book • Task work on questions 	Able State the data needed for plant installation planning, product analysis, process analysis	RU-1, RU-2, RU-3 and RU-4

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(4)	CLO-4.1.:[CP-2.1, 2.2, 2.3, 3.3] College student Able to design material flow / work station. Work station planning Determine the area required by industrial companies	Planning Work Stations and Determination of the Area Required.	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book • Task work on questions 	Able designing the flow of materials / work station Work station planning Determine the area required by industrial companies	RU-1, RU-2, RU-3 and RU-4
(5)	CLO-4.2.:[CP-2.1, 2.2, 2.3, 3.3] College student Able to design material flow / work station. Work station planning Determine the area required by industrial companies	<ul style="list-style-type: none"> • Process Layout • Work Station Relationship 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book • Task work on questions 	Able designing the flow of materials / work station Work station planning Determine the area required by industrial companies	RU-1, RU-2, RU-3 and RU-4
(6)	CLO-4.3.:[CP-2.1, 2.2, 2.3, 3.3] College student Able to design material flow / work station. Work station planning Determine the area required by industrial companies	<ul style="list-style-type: none"> • Comparison between product layout and process layout 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book • Work on problems 	Able designing the flow of materials / work station Work station planning Determine the area required by industrial companies	RU-1, RU-2, RU-3 and RU-4
(7)	CLO-6.1: [CP-2.1, 2.2, 2.3, 3.4, 5.2] College student State the type of material transfer, material transfer	<ul style="list-style-type: none"> • Type of Material Transfer • Material Transfer Function 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book 	Able State the type of material transfer, material transfer function, material transfer	RU-1, RU-2, RU-3 and RU-4

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	function, material transfer equipment			<ul style="list-style-type: none"> Work on problems 	equipment	
(8)	Mid-Test Exam					
(9)	CLO-6.2: [CP-2.1, 2.2, 2.3, 3.4, 5.2] College student Mention type of material transfer, material transfer function, material transfer equipment.	<ul style="list-style-type: none"> Material Transfer Equipment Conveter belt Dump truck Wheel loaders Fork lift 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Task work on questions 	Able State the type of material transfer, material transfer function, material transfer equipment	RU-1, RU-2, RU-3 and RU-4
(10)	CLO-5.1: [CP-2.1, 2.3, 5.2] Students are capable Provide definitions of warehousing definitions of warehousing functions. Determine Factory Floor Area	<ul style="list-style-type: none"> Warehouse definition of Scope of Warehousing Determining the Factory Floor Area 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Task work on questions 	able Provide the definition of warehousing, the definition of the functions of warehousing Determining the Factory Floor Area	RU-1, RU-2, RU-3 and RU-4

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(11)	CLO-6.1: [CP-2.1, 2.2, 2.3, 3.4, 5.2] Students are capable knowing about pumps and their application, definitions of pumps, types and working principles of pumps, calculating head, power and explaining pump performance, types of pump drives	<ul style="list-style-type: none"> Pump Definition Types and working principles of pumps 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Task work on questions 	Able Knowing about the pump and its application, the definition of the pump, the type and working principle of the pump, calculating the head, power and explaining the pump performance, the type of pump drive	RU-1, RU-2, RU-3 and RU-4
(12)	CLO-6.2: [CP-2.1, 2.2, 2.3, 3.4, 5.2] Students are capable knowing about the pump and its application, the definition of the pump, the type and working principle of the pump, calculating the head, power and explaining the pump performance, the type of pump drive	<ul style="list-style-type: none"> Head calculation, power and pump performance graph Pump drive type 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> Make a summary and description of the material presented in the resume book Task work on questions 	Knowing about the pump and its application, the definition of the pump, the type and working principle of the pump, calculating the head, power and explaining the pump performance, the type of pump drive	RU-1, RU-3, RP-1 and RP-2
(13)	CLO-6.3: [CP-2.1, 2.2, 2.3, 3.4, 5.2] Students are capable knowing the pump and its application, explaining	<ul style="list-style-type: none"> Working Principles and Types of compressors Compressor Performance 	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 	Able Knowing the pump and its application, explaining the working principle of	RU-1, RU-3, RP-1 and RP-2

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	the working principle of the compressor, compressor performance				the compressor, compressor performance	
(14)	CLO-6.4: [CP-2.1, 2.2, 2.3, 3.4, 5.2] Students are capable Understanding and Knowing Blowers and fans, and explaining the working principles of blowers and fans, blower and fan performance	<ul style="list-style-type: none"> Working Principles of the types of blowers and fans Blower and fan performance 	Group percentage [1x80 ' Question and answer [1x10 ' Conclusion[1x10 '	<ul style="list-style-type: none"> Making group presentations on non-conventional energy (4 groups) Group discussion about fans and blowers 	Able Understanding and Knowing Blowers and fans, and explaining the working principles of blowers and fans, blower and fan performance	RU-1, RU-3, RP-1 and RP-2
(15)	CLO-6.5: [CP-2.1, 2.2, 2.3, 3.4, 5.2] Students are capable Knowing the principles of the Water Turbine and their application, State and explain the working principle of the turbine, Calculate the power, efficiency of the water turbine	<ul style="list-style-type: none"> Working Principles and Types of Water Turbines Power, efficiency and cavitation in Water Turbines 	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<p>Make a summary and description of the material presented in the resume book</p> <ul style="list-style-type: none"> Group discussion about turbines 	Be able to explain Knowing the principles of the Water Turbine and their application, State and explain the working principle of the turbine, Calculate the power, efficiency of the water turbine	RU-1, RU-3, RP-1 and RP-2
(16)	Final Exam					

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)

The linkage between CLO and PLO and assessment methods

MES1.52.5008	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	UTS. 1	5		V		V																	
CLO-2	UTS. 2	7.5				V	V	V															
CLO-3	UTS. 3	7.5	V			V	V	V				V						V					
CLO-4.1	UTS. 4	7.5				V	V	V			V												
CLO-4.2	UTS. 5	7.5				V	V	V			V												
CLO-6.2	UAS. 1	7.5				V	V	V				V								V			
CLO-5.1	UAS. 2	7.5				V	V													V			
CLO-6.1	UAS. 3	7.5				V	V	V				V								V			
CLO-6.2	UAS. 4	7.5				V	V	V				V								V			
CLO-6.3	UAS. 5	5				V	V	V				V								V			
CLO-6.4	Presentation	20				V	V	V				V								V			
CLO-6.5	Presentation					V	V	V				V									V		
Presence		10																					
TOTAL		100																					

Assessment Component

Midterm exam : 35%
 Final exams : 35%
 Duty : 20%
 Presence : 10%
 Total : 100%

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				

