



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		
Hydraulic and pneumatic	MES1.61.6101	Study program Compulsory Courses/ MEVE Core Course	1	1	6	
Responsible	Drs. Purwantono, M.Pd, Dr. I. Arwizet K, ST, MT, Drs. Novri Helmi, M. Kes, Bulkia Rahim, M.Pd, Andre Kurniawan, ST, 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 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 					

	<ul style="list-style-type: none"> 2.2. problem analysis skills 2.3. problem evaluation skills 3. Possess a good ability in designing, manufacturing and operating machines (Engineering design) <ul 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 <i>mechanical engineering vocational education</i>. (Education design) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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	Course Learning Outcomes (CP-MK)

Outcomes	CLO		PLO	
	1. Students can understand the basics of hydraulic systems		2.2, 2.3, 3.2, 3.3	
	2. Skilled students do a hydraulic system circuit		2.2, 2.3, 3.2, 3.3, 5.1, 5.2, 5.3	
	3. Students can understand the basics of the pneumatic system		2.2, 2.3, 3.2, 3.3	
	4. Skilled students do system chaining pneumatic		2.2, 2.3, 3.2, 3.3, 5.1, 5.2, 5.3	
Course descriptions	This course provides knowledge Pneumatic and Hydraulic concepts include; air properties, density, viscosity and air constants, basic thermodynamics, PV and TS diagrams, pneumatic equipment, circuits in pneumatic systems, hydraulic theory, fluid flow and their equations, hydraulic equipment, circuits in hydraulic systems, application of pneumatic and hydraulic systems in industry			
References	Main references (RU):			
	1. William. W. (1990). Modern Hydraulics 2. Sugeng I. (1994). P. Pneumatic Control System			
	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	Mo			

COURSE SUBJECTS

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(1)	CLO-1: [PLO-2.1, 2.2, 2.3] Students are capable : Describe Fundamental hydraulics	Fundamental hydraulics	Lecture [1x80 ' Discussion [1x20 ' Demonstration [1x40 ' Conclusion [1x10 '	Make a summary and description of the material presented in the resume book	Oral and written	RU-1, Rp-1
(2)	CLO-1: [PLO-2.1, 2.2, 2.3] Students are capable understand the application of Pascal's law, hydraulic system applications	1. Pascal's law application 2. Hydraulic system applications	Lecture [1x80 ' Discussion [1x20 ' Demonstration [1x40 ' Conclusion [1x10 '	Make a summary and description of the material presented in the resume book	Oral and written	RU-1, Rp-1
(3)	CLO-2: [PLO-5.1, 5.2, 5.3] Students are capable Understand hydraulic system component names and symbols The system works when viewed from the symbol	1. Hydraulic system component names and symbols 2. The system works when viewed from the symbol	Lecture [1x50 ' Discussion [1x20 ' Pratikum [1x70 ' Conclusion [1x10 '	Make a summary and description of the material presented in the resume book Practical series of Hydraulic Job system series 1,2	Oral and written and practicum	RU-1, Rp-1
(4)	CLO-2: [CP-5.1, 5.2, 5.3] College student Understand the function of hydraulic system circuit components and how simple circuits work in a hydraulic system	1. Know the components of the hydraulic system circuit 2. Simple circuit operation of hydraulic systems	Lecture [1x50 ' Discussion [1x20 ' Pratikum [1x70 ' Conclusion [1x10 '	Make a summary and description of the material presented in the resume book Practical series of hydraulic systems Job 3 and 4	Oral and written and practicum	RU-1, Rp-1
(5)	CLO-2: [CP 5.1, 5.2, 5.3] College student Know the component names and how the hydraulic pumps work .	1. Types of hydraulic pumps 2. Work each hydraulic pump	Lecture [1x50 ' Discussion [1x20 ' Pratikum [1x70 ' Conclusion [1x10 '	Make a summary and description of the material presented in the resume book Practical series of hydraulic systems Job 5 and 6	Oral and written and practicum	RU-1, Rp-1
(6)	CLO-2: [CP-5.1, 5.2, 5.3]	1. Hydraulic motor type	Lecture [1x50 '	Make a summary and	Oral and written and	RU-1, Rp-1

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	College student Know the component names and hydraulic motor work	2. How the hydraulic motor works	Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	description of the material presented in the resume book Practical series of hydraulic systems Job 7 and 8	practicum	
(7)	CLO-2: [CP-5.1, 5.2, 5.3] Students can explain the control units in a unit And designing a hydraulic system unit	1. Hydraulic controller component name 2. How the hydraulic components work in a unit 3. designing a hydraulic system unit	Lecture [1x50 '] Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practical series of hydraulic systems Job 9 and 10	Oral and written and practicum	RU-1, Rp-1
(8)	Mid-Test					
(9)	CLO-3: [CP-2.1, 2.2, 2.3] College student can know the principles of the pneumatic system	1. Pneumatic basics	Lecture [1x80 '] Discussion [1x20 '] Demonstration [1x40 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-2, Rp-2 and Rp-3
(10)	CLO-3: [CP-2.1, 2.2, 2.3] College student can know the principles of the pneumatic system	Standard pneumatic pressure unit and support equipment	Lecture [1x80 '] Discussion [1x20 '] Demonstration [1x40 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-2, Rp-2 and Rp-3
(11)	CLO-3: [CP-2.1, 2.2, 2.3] Students can find out the basics of calculations in the pneumatic system	1. Calculation of air pressure 2. Air flow discharge. 3. Speed and piston force 4. Basic calculation of motor power	Lecture [1x80 '] Discussion [1x20 '] Demonstration [1x40 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-2, Rp-2 and Rp-3
(12)	CLO-4: [CP-5.1, 5.2, 5.3.] Students can find out the working principle and symbols of the valves used in the system	a. Steering Valve b. Non-return valve	Lecture [1x50 '] Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum of the	Oral and written and practicum]	RU-2, Rp-2 and Rp-3

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
				Pneumatic System Job series 1 and 2		
(13)	CLO-4: [CP-5.1, 5.2, 5.3.] Students can find out the working principle and symbols of the valves used in the system	Two press valves and Pressure regulating valve Another valve	Lecture [1x50 '] Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum of the Pneumatic Job system series 3 and 4	Oral and written and practicum]	RU-2, Rp-2 and Rp-3
(14)	CLO-4: [CP-5.1, 5.2, 5.3.] Students can analyze the work of the pneumatic system	1. How the pneumatic system works 2. How the cylinder works	Lecture [1x50 '] Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum of the Pneumatic Job system series 5 and 6	Oral and written and practicum]	RU-2, Rp-2 and Rp-3
(15)	CLO-4: [CP-5.1, 5.2, 5.3.] Students can analyze the work of the pneumatic system And designing a hydraulic system unit	Pneumatic applications in the production process Designing a hydraulic system unit	Lecture [1x50 '] Discussion [1x20 '] Pratikum [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum of the Pneumatic System Job series 7 and 8	Oral and written and practicum]	RU-2, Rp-2 and Rp-3
(16)	Final exams					

Assessment Component

Midterm exam (UTS)	: 35%
Final exam(UAS)s	: 35%
Assignments	: 20%
<u>Presence</u>	<u>: 10%</u>
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
The 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				

