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		
Machine Maintenance	MES1.61.4105	Study Program Compulsory Courses / MEVE Core Courses	1	2	1	1
Responsible	Drs. Jasman, M.Kes; Drs. Irzal, M.Kes		Signature _____			

INFORMATION	**Dean**	**Head of Department**	**Coordinator of study program**
	Dr. Fahmi Rizal, M.Pd., MT NIP. 195912041985031004	Drs. Purwantono, M.Pd NIP. 196308041986031002	Drs. Purwantono, M.Pd NIP. 196308041986031002

Program Learning Outcomes	**Program Learning Outcomes (PLO):**
	1. Possess a good ability to apply the basic science (mathematics and natural sciences) and other disciplines in profesional jobs / projects (Knowledge-understanding) 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):*** 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 (CLO)**

CLO	**PLO**
1. Mastering the basic theoretical concepts of machining maintenance	2.1, 2.2, 2.3, 5.2
2. Understand machine maintenance management	2.1, 2.2, 2.3, 5.1, 5.2
3. Understand machine maintenance classifications	2.1, 2.2, 2.3, 5.1, 5.2
4. Understand machine maintenance planning time	2.1, 2.2, 2.3, 5.1, 5.2
5. Understand industrial machine maintenance	2.1, 2.2, 2.3, 5.1, 5.2
6. Make observations on machines that will be maintained	2.1, 2.2, 2.3, 5.2

Short course descriptions	Learn about the maintenance and repair of machines and equipment in the industry	
References	**Main references (RU):**	
	1. Mann, Lawrence; Maintenance Management, John Wiley, 1973. 2. Corder A; Maintenance Management Techniques, McGraw Hill, 1976. 3. United Tractor Service Division; Proactive Maintenance. Japan	
	Additional references (RP)	
Learning Media	**Software:**	**Hardware:**
		Computers, whiteboards and accessories, projectors, engineering materials testing machines
Team Teaching		
Assessment	Assignments, Quis, UTS, UAS	
Requirements Subject	No	

COURSE SUBJECTS

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(1)	**CLO-1: (PLO-1.1, 1.2)** Students are capable Mastering the basic theoretical concepts of machining	Basic Theory of Machine Maintenance. The importance of machine maintenance	Material explanation **[1x100 ']** Question and answer **[1x50 ']** Work on assignments	Make a summary and description of the material presented in the resume book	Able to explain basic machine maintenance theory	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
	maintenance		**[1x150 ']**			
(2)	**CLO-2.1: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance management	Machine maintenance management. • Machine maintenance administration • Machine maintenance management organizational structure	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand machine maintenance management	RU-1, RU-2 and RU-3
(3)	**CLO-2.2: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance management	Machine maintenance management. • Machine maintenance method • Experts in machine maintenance	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand machine maintenance methods	RU-1, RU-2 and RU-3
(4)	**CLO-3.1: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance classification	• Planned maintenance • Unplanned maintenance	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand machine maintenance classification	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(5)	**CLO-3.2: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance classification	• Maintenance breakdone • Downtime maintenance • Preventive maintenance •	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand machine maintenance classification	RU-1, RU-2 and RU-3
(6)	**CLO-3.3: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance classification	• Corrective maintenance • Predictive maintenance • Proactive maintenance • Condition monitoring	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand machine maintenance classification	RU-1, RU-2 and RU-3
(7)	**CLO-3.4: [PLO-1.1, 1.2, 3.1, 3.2, 5.1]** Students are capable Understand machine maintenance time	• List of engine maintenance plans • Machine maintenance frequency (based on calendar time scale and based on operating time) • Application of critical schedules	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand types of machine maintenance	RU-1, RU-2, RU-3
(8)	**Mid-Test (UTS)**					

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(9)	**CLO-4.1: [PLO- 3.1, 3.2, 5.1]** Students are capable Understand industrial machine maintenance	• Bearing / bearing maintenance • Bearing lubrication system	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand bearing maintenance	RU-1, RU-2 and RU-3
(10)	**CLO-4.2: [PLO-3.1, 3.2, 5.1]** Students are capable Understand the types of machine maintenance	• Machine vibration analysis • The cause of the vibration in the machine	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to study machine vibration	RU-1, RU-2 and RU-3
(11)	**CLO-4.3: [PLO-3.1, 3.2, 5.1]** Students are capable Understand the types of machine maintenance	• Machine alignment • Machine alignment method	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand how to align the machine	RU-1, RU-2 and RU-3
(12)	**CLO-4.4: [PLO-3.1, 3.2, 5.1]** Students are capable Understand the types	Rotor Unbalance • Cause of Unbalance • The effect of unbalance	Material explanation **[1x100 ']** Question and answer **[1x15 ']**	• Make a summary and description of the material presented in the	Able to understand unbalance treatment	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
	of machine maintenance		Work on assignments **[1x185 ']**	resume book. • Create structured assignments	procedures	
(13)	**CLO-4.5: [PLO-3.1, 3.2, 5.1]** Students are capable Understand the types of machine maintenance	Rotor Unbalance • Static Balancing Procedure • Preparation of static balancing • Two point method	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to understand unbalance treatment methods	RU-1, RU-2 and RU-3
(14)	**CLO-5.1: [PLO-3.1, 3.2, 5.1, 5.2]** Students are capable make observations on the machine	Observation on the machine • Perform case studies on machines • Make a maintenance analysis on the machine	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to perform machine maintenance.	RU-1, RU-2 and RU-3
(15)	**CLO-5.2: [PLO-3.1, 3.2, 5.1, 5.2]** Students are capable make observations on the machine	Observation on the machine • Perform data analysis from observations • Make a report on the results of observations • Plan maintenance on the machine after	Material explanation **[1x100 ']** Question and answer **[1x15 ']** Work on assignments **[1x185 ']**	• Make a summary and description of the material presented in the resume book. • Create structured assignments	Able to perform maintenance analysis on the machine after observation.	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
		observation				
(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)

The linkage between CLO and PLO and assessment methods

MSN1.62.4007	Assessment	Weight (%)	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	5		V	V	V	V																
CLO-3	UTS. 3	5		V	V	V	V																
CLO-4.1	UTS.4.1	10				V	V	V			V												
CLO-4.2	UTS.4.2					V	V	V			V												
CLO-4.3	UTS.4.3					V	V	V			V												
CLO-4.4	UTS.4.4					V	V	V			V												
CLO-4.5	UAS. 1	7.5				V	V	V			V												
CLO-4.6	UAS. 2	7.5				V	V	V			V												
CLO-4.7	UAS. 3	7.5				V	V	V			V												
CLO-4.8	UAS. 4	7.5				V	V	V			V												
CLO-5.1	Presentation	30				V	V	V		V	V					V							
CLO-5.2	Presentation					V	V	V		V	V					V							
CLO-6	UAS. 5	5																		V		V	
Presence		10																					
TOTAL		100																					

Assessment Component

Midterm exam (UTS)	: 25%
Final exams (UAS)	: 35%
Assignment	: 30%
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 analysize 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	-	Tertunda
60 – 64	C+	2.3	Acceptable				