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 Elements	MES1.61.3106	Study Program Compulsory Courses/ MEVE core course	2	0	3	1
Responsible	Hendri Nurdin, ST, MT; Andril Arafat, ST, M.Eng, Ph.D; Rodesri, ST, MT		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 Outcome	**Program Learning Outcome of Mechanical engineering vocational education:**

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	**Course Learning Outcomes**

<table>
<tr><td>Outcomes</td><td>
<table>
<tr><th>CLO</th><th>PLO</th></tr>
<tr><td>1. Know the basic theory of machine elements</td><td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2, 5.4</td></tr>
<tr><td>2. Understand the basic concepts of machine construction joints</td><td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2, 5.4</td></tr>
<tr><td>3. Understand the basic concepts of calculating the power transmission in machine construction</td><td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2, 5.4</td></tr>
<tr><td>4. Understand the design and application of machine elements in machine construction</td><td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2, 5.4</td></tr>
</table>
</td></tr>
<tr><td>Course descriptions</td><td>Provides knowledge of basic machine construction</td></tr>
<tr><td>References</td><td>Main References (RU):
1. Holowenko, Hall & Laughlin, (____). Theory and Problems of Machine Design. Mc Graw Hill: Singapore.
2. Khurmi, RS & Gupta, JK, (____). A Textbook of Machine Design. Eurasia Publication: India.
3. Neiman, G. (____). Machine Element. Erlangga: Jakarta.
4. Sularso & Suga, Kiyokatsu, (____). Basic Planning and Selection of Machine Elements. PT. Pradnya Paramita: Jakarta
Additional references (RP)</td></tr>
<tr><td>Learning Media</td><td>Software:</td><td>Hardware:
Computers, whiteboards and accessories, projectors, engineering materials testing machines</td></tr>
<tr><td>Team Teaching</td><td></td></tr>
<tr><td>Assessment</td><td>Assignments, Quis, UTS, UAS</td></tr>
<tr><td>Requirements Subject</td><td>No</td></tr>
</table>

LEARNING SUBJECTS

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(1)	**CLO-1: (PLO-1.2, 1.3)** Students are able to explain the basic theory of machine construction	Basic theory of machine construction. Basics of engine elements	Material explanation **[1x100 ']** Question and answer **[1x50 ']** Work on assignments **[1x150 ']**	Make a summary and description of the material presented in the resume book	Be able to explain the basic theory of machine elements	RU-1 and RU-4
(2)	**CLO-2.1: [PLO-3.1., 3.3]** Students are able to understand the basic concepts of connections in machine construction	Machine construction joints. • Types of connection • Connection method by welding • Advantages and disadvantages of welded joints	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 master the basic concepts of welding joints	RU-1 and RU-4
(3)	**CLO-2.2: [** PLO-3.1., 3.3] Students are able to understand the basic concepts of connections in machine construction	Machine construction joints. • Method of connection with rivets • Advantages and disadvantages of rivet joints	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 master the basic concept of rivet connection	RU-1 and RU-4

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(4)	**CLO-2.3: [** PLO-3.1., 3.3] Students are able to understand the basic concepts of connections in machine construction	Machine construction joints. • Bolt and nut connection method • The advantages and disadvantages of bolt and nut joints	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 master the basic concept of bolt and nut connection	RU-1 and RU-4
(5)	**CLO-3.1: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • Types of power transmission • Belt transmission calculation method • Types of belts and their applications • Belt strength calculation • The advantages and disadvantages of the belt	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 master the basic concepts of belt power transmission	RU-1 and RU-4
(6)	**CLO-3.2: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • The method of calculating the transmission with a chain drive • Types of chains and their applications • Chain strength calculation	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 master the basic concept of chain transmission	RU-1 and RU-4

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
		• The advantages and disadvantages of chain transmission				
(7)	**CLO-3.3: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • The pulli calculation method • Types of pulli and their applications • The calculation of the pulli strength based on the type of material • The advantages and disadvantages of pulli	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 master the basic concept of using pulli	RU-1 and RU-4
(8)	**CLO-3.4: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • Gear transmission calculation method • Types of gears and their applications • Calculation of gear strength and gear • The advantages and disadvantages of gear transmission	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 master the basic concepts of gear power transmission	RU-1 and RU-4

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(9)	**Mid-Test**					
(10)	**CLO-3.5: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • The method of making a shaft in machine construction • Types of shafts and their applications • Calculation of shaft strength and type of material	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 the basic concept of shaft calculation	RU-1 and RU-4
(11)	**CLO-3.6: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission. • Method of making pegs in machine construction • Types of shafts and their applications • Calculation of post width based on the type of material	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 the basic concept of peg calculation	RU-1 and RU-4
(12)	**CLO-3.7.1: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine	Power transmission clutch. • Types of coupling • The method of making a clutch in engine construction	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 the basic concept of coupling	RU-1 and RU-4

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
	construction					
(13)	**CLO-3.7.2: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power transmission clutch. • Coupling calculation • Coupling use applications	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 coupling calculations and applications	RU-1 and RU-4
(14	**CLO-3.8: [PLO-3.1., 3.2., 3.3., 3.4]** Students are able to understand Understand the basic concepts of calculating the power transmission in machine construction	Power Transmission • Types of bearings • Bearing strength analysis • The advantages and disadvantages of bearing • Bearing applications in machine construction	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 calculations and their applications	RU-1 and RU-4
(15)	**CLO-4: [PLO-3.1., 3.2., 3.3., 3.4]** Students are capable Mamamoo design and application of machine elements in machine construction.	Machine element application • Design of machine elements • Designing machine elements with software and calculating the strength of	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 design machine elements based on their use.	RU-1 and RU-4

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
		something with the application.				
(16)	**Final Test**					

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	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			V	V																		
CLO-2.1	UTS. 2									V	V												
CLO-2.2	UTS. 3									V	V												
CLO-2.3	UTS.4.1									V	V												
CLO-3.1	UTS.4.2								V	V	V	V											
CLO-3.2	UTS.4.3								V	V	V	V											
CLO-3.3	UTS.4.4								V	V	V	V											
CLO-3.4	UAS. 1								V	V	V	V											
CLO-3.5	UAS. 2								V	V	V	V											
CLO-3.6	UAS. 3								V	V	V	V											
CLO-3.7	UAS. 4								V	V	V	V											
CLO-3.8	Presentation								V	V	V	V											
CLO-4	Presentation								V	V	V	V											

Presence		10							V	V	V	V											
TOTAL		100							V	V	V	V											

Assessment Component

Midterm Test (UTS) : 35%

Final exams (UAS) : 35%

Assignments : 20%

Presence : 10%

Total : 100%

Scring/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				