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		
Kinematics and Dynamics	MES1.61.4102	Study Program Compulsory Courses / MEVE Core Courses	2	0	4	1
Responsible	Delima Yanti Sari, MT, Ph.D., Andre Kurniawan, 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 Outcomes	Study Program 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	**Course Learning Outcomes (CLO)**

<table>
<tr><td>Outcomes</td><td>
<table>
<tr><th>CLO</th><th>PLO</th></tr>
<tr><td>1. Understand the basic concepts of speed and acceleration including relative speed and acceleration in the mechanism of a moving engine component</td><td>1.2, 2.1, 2.2</td></tr>
<tr><td>2. Understand the basic concepts of static force and graphic statics including equilibrium, force as a vector, coupling, three, four, five or more non-parallel forces in balance, parallel forces, parallel forces, and resultant forces.</td><td>1.2, 2.1, 2.2</td></tr>
<tr><td>3. Understand the basic concepts energy includes kinetic energy and mechanical energy and its application to impulses and collisions</td><td>1.2, 2.1, 2.2</td></tr>
<tr><td>4. Understand the basic concepts of inertia forces including the center of mass, moment of inertia, flywhell, the force in motion, the rotating link to a point, the connection in translation, and the moment of inertia</td><td>1.2, 2.1, 2.2</td></tr>
</table>
</td></tr>
<tr><td>Short course descriptions</td><td>This course provides knowledge of kinematics and dynamics in the field of mechanical engineering, as well as solving kinematics problems in the mechanism of moving machine components.</td></tr>
<tr><td rowspan="4">References</td><td>Main references (RU):</td></tr>
<tr><td>1. Holowenko, AR, Cendy Prapto, "Machining Dynamics". Erlangga, Jakarta, 1992
2. Martin, GH, "Kinematics and dynamics of Machines", 2nd edition, McGraw-Hill, Tokyo, 1978</td></tr>
<tr><td>Additional references (RP)</td></tr>
<tr><td>1. Suh, CH, "Kinematics and Mechanisms Design", John Wiley, New York, 1978
2. Mabie, Oevik, (1975). Mechanics and Dynamics of Machinery. John Willey: Singapore</td></tr>
<tr><td rowspan="2">Learning Media</td><td>Software:</td><td>Hardware:</td></tr>
<tr><td></td><td>Computer, LCD Projector and Whiteboard and peripherals</td></tr>
<tr><td>Team Teaching</td><td colspan="2"></td></tr>
<tr><td>Assessment</td><td colspan="2">Mid-Term Exam, Final Exam, Independent & group assignments, Group presentations</td></tr>
<tr><td>Requirements Subject</td><td colspan="2">No</td></tr>
</table>

Course Subjects

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(1)	**CLO-1.1: (PLO-1.2, 2.1, 2.2)** Students are able to understand the lecture contract and basic concepts of kinematics and dynamics	Lecture contract and introduction to kinematics and dynamics	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion [1x20 ']	Make a summary and description of the Subject presented in the resume book	Able to apply lecture contracts and explain basic concepts of kinematics and dynamics	RU-2
(2)	**CLO-1.2: [PLO-1.2, 2.1, 2.2]** Students are able to understand basic concepts speed and acceleration	The basic concept of linear velocity and acceleration as well as velocity and angular acceleration	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding velocity and linear acceleration and velocity and angular acceleration	RU-1 and RU-2
(3)	**CLO-1.3: [PLO-1.2, 2.1, 2.2]** Students are able to understand the basic concept of relative speed	The basic concept of speed relative of two distinct points and two points on a link	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding speed relative of two distinct points and two points on a link	RU-1 and RU-2
(4)	**CLO-1.4: [PLO-1.2, 2.1, 2.2]** Students are able to understand basic concepts relative velocity in a mechanism	The basic concepts of the relative speed of the crank-launch mechanism, the four-link mechanism, the shrink mechanism, the cam, the gears and the combination	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding relative speed of the crank-launch mechanism, the four-link	RU-1

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
					mechanism, the shrink mechanism, the cam, the gears and the combination	
(5)	**CLO-1.5: [CP-1.2, 2.1, 2.2]** Students are able to understand specific methods of speed completion	The special method solves the speed equation for the mechanism of Watt's roadblock, modified shrink, Stephenson, Wanzer needle rod	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding speed road beam mechanism Watt, modified shrink, Stephenson, Wanzer needle rod	RU-1
(6)	**CLO-1.6: [CP-1.2, 2.1, 2.2]** Students are able to understand basic concepts relative acceleration in a mechanism	The basic concept of the relative acceleration of a point on a link, at two points of one connection, at a point rotating about a central point	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book	Be able to solve the problem of the relative acceleration of a point on a link, at two points of one connection, at a point that rotates towards a central point.	RU-1
(7)	**CLO-1.7: [CP-1.2, 2.1, 2.2]** Students are able to understand basic concepts relative acceleration in a mechanism	The basic concepts of the relative acceleration of the crank-launch mechanism, the four-link mechanism, the powell engine, the breaking jaw and the privileged position	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding the relative acceleration of the crank-launch mechanism, the four-link mechanism, the	RU-1

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
					powell engine, the breaking jaw and the privileged position.	
(8)	**Mid-Test**					
(9)	**CLO-1.8: [CP-1.2, 2.1, 2.2]** Students are able to understand basic concepts the two-point acceleration coincides	The basic concept of Coriolis component acceleration, shrink mechanism, Oscillating roller follower	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding the acceleration of the Coriolis component, shrink mechanism, Oscillation roller follower	RU-1 and RU-2
(10)	**CLO-1.9: [CP-1.2, 2.1, 2.2]** Students are able to understand the special method of accelerating completion	The special method solves the equation for the acceleration of the Watt road block mechanism and the modified shrink	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to understand specific methods and solve problems regarding acceleration	RU-1 and RU-2
(11)	**CLO-1.10: [CP-1.2, 2.1, 2.2]** Students are able to understand equivalent mechanisms	Solving some equivalent mechanism cases	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding some cases of equivalent mechanisms	RU-1 and RU-2

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(12)	**CLO-2: [CP-1.2, 2.1, 2.2]** Students are able to explain discussions about static style and graphic statics	The basic concept of the equilibrium equation, force as a vector, coupling, three, four, five or more forces are not parallel in balance, force is parallel, force is parallel, and resultant force	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding static force and graphic statics	RU-1 and RU-2
(13)	**CLO-3: [PLO-1.2, 2.1]** Students are able to understand the concepts of energy, impulses, and collisions	The basic concept of kinetic energy and mechanical energy	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book • Task work on questions	Able to solve problems regarding kinetic energy and mechanical energy (impulses and collisions)	RU-1, RU-2, RP-1 and RP-2
(14)	**CLO-4.1: [PLO 1.2, 2.1]** Students are able to understand the concept of a point center of mass, moment of inertia, and flywhell	The concept of center of mass, moment of inertia, and flywhell	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book	Be able to solve problems regarding the point center of mass, moment of inertia, and flywhell	RU-2
(15)	**CLO-4.2: [PLO 1.2, 2.1]** Students are able to analyze inertia forces	The concept of force in plane motion, a rotating link to a point, a link in translation, and a moment of inertia	Subject description [1x70 '] Frequently asked questions [1x10 '] Discussion about the questions given [1x20 ']	• Make a summary and description of the Subject presented in the resume book	Able to solve problems regarding inertia forces	RU-2
(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-1.1	UTS. 1	5		V		V	V																
CLO-1.2	UTS. 2	5		V		V	V																
CLO-1.3	UTS. 3	5		V		V	V																
CLO-1.4	UTS. 4	5		V		V	V																
CLO-1.5	UTS. 5	5		V		V	V																
CLO-1.6	UTS. 6	5		V		V	V																
CLO-1.7	UTS. 7	5		V		V	V																
CLO-1.8	UAS. 1	5		V		V	V																
CLO-1.9	UAS. 2	5		V		V	V																
CLO-1.10	UAS. 3	5		V		V	V																
CLO-2	UAS. 4	5		V		V																	
CLO-3	UAS. 5	5		V		V																	
CLO-4.1	UAS. 6	5		V		V																	
CLO-4.2	UAS. 7	5		V		V																	
Presence		10																					
TOTAL		100																					

Assessment Component

Midterm exam (UTS)	: 35%
Final exams (UAS)	: 35%
Assignment	: 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 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				