	Universitas Negeri Surabaya **Faculty of Engineering,** **Mechanical Engineering Undergraduate Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Kinematics Dynamics 2	2120102116	Compulsory Curriculum Subjects - National	**T=2**	**P=0**	**ECTS=3.18**	3	September 4, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-5	Work independently and in groups
	PLO-14	Science and engineering knowledge
	Program Objectives (PO)	
	PO - 1	Abilities Identify specific facts about mathematics, science, and engineering that are needed for specific situations (What knowledge is needed?)
	PO - 2	Able to demonstrate appropriate use of specific facts of mathematics, science, and engineering to elicit performance behavior given specific input.
	PO - 3	Able to obtain data about appropriate variables in the field of Mechanical Engineering.
	PO - 4	Able to formulate problems and identify main problems / variables
	PLO-PO Matrix	

P.O	PLO-5	PLO-14
PO-1		
PO-2		
PO-3		
PO-4		

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description	Understanding, mastery and analysis of the material of kinematics of particles & rigid bodies in absolute & relative motion, position, speed and acceleration of objects as well as kinematics in a slider-crank & four-bar linkage mechanism using graphical methods.	
References	**Main :**	

1. R. C. Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.
2. David H. Myszka. 2012. Machines and Mechanism Applied Kinematic Analysis, 4th Edition. Prentice Hall Inc.
3. Priyo Heru Adiwibowo. 2013. Kinematika dan Dinamika, Bagian 1 Kinematika. Unesa Uneversity Press.
4. Martin, George H. 1982. Kinematics and Dynamics of Mechanics, 2nd Edition. McGraw Hill.
5. Ferdinand P. Beer, E. Russell Johnston Jr. 2010. Vector Mechanics for Engineers, Static and Dynamics, 9th Edition. McGraw Hill.
6. J. L. Meriam, L. G. Kraige. 2012. Engineering Mechanics, 7nd Edition. John Wiley and Sons Inc.

Supporters:	
Supporting lecturer	Diastian Vinaya Wijanarko, S.T., M.T. Ika Nurjannah, S.Pd., M.T.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Students are able to understand and analyze the basic concepts of Kinematics and Dynamics and are able to use Physical Quantities, Symbols and Units	1.Able to explain Kinematic analysis of particle dynamics, rigid bodies and mechanisms 2.Able to use physical quantities, symbols and units	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Introductory lecture and brainstorming, Lecture, discussion, questions and answers 2 X 50		**Material:** Lecturer's explanation of the kinematics and dynamics of particles and rigid bodies. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%
2	Students are able to determine the Degrees of Freedom (DoF) in mechanisms and are able to use vectors in dynamic kinematics	1.Able to draw kinematic diagrams 2.Able to determine degrees of freedom 3.Skilled in using vectors	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, exercises and assignments 2 X 50		**Material:** Explanation of the stages of drawing kinematic diagrams, how to determine degrees of freedom in a mechanism, and the use of vectors in dynamic kinematics. **Reference:** *Martin, George H. 1982. Kinematics and Dynamics of Mechanics, 2nd Edition. McGraw Hill.*	0%

3	Students are able to understand and analyze particles in straight, rectangular, curved and projectile motion.	1. Able to distinguish & analyze the movement of a particle. 2. Able and skilled at solving kinematics problems	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Discussion, questions and answers, exercises and assignments 2 X 50		**Material:** Reading various documents on the movement of a particle in kinematics along with examples of its application. **Reference:** *Martin, George H. 1982. Kinematics and Dynamics of Mechanics, 2nd Edition. McGraw Hill.*	0%
4	Students are able to understand and analyze the relative motion of two particles	1. Able to analyze the relative motion of two particles 2. Skilled in solving problems of relative motion of two particles	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Discussion and questions and answers 2 X 50		**Material:** Analyzing relative motion for speed and acceleration between two particles with everyday examples. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%
5	Students are able to understand the motion of rigid bodies in kinematics and are able to analyze translational and rotational motion	1. Able to analyze the kinematics of rigid bodies 2. Skilled in solving kinematics problems of translational and rotational rigid bodies	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** Explanation of the movement of a rigid body in the kinematics of both translational and rotational systems. **Reference:** *David H. Myszka. 2012. Machines and Mechanisms Applied Kinematic Analysis, 4th Edition. Prentice Hall Inc.*	0%

6	Students are able to understand movement in the absolute plane and speed in the relative motion of rigid bodies	Able to analyze and be skilled at solving speed problems in the relative motion of rigid objects	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** explanation of the differences between absolute and relative motion of rigid bodies in the concept of object speed. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%
7	Students are able to understand acceleration in the relative motion of rigid bodies and are able to analyze speed & acceleration in the relative motion of rigid bodies	1. Able to analyze acceleration problems in the relative motion of rigid bodies 2. Skilled in using the relative motion of rigid bodies at speed and acceleration	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** Listen to an explanation of the relative motion of a rigid object on the acceleration of the object. Can give examples of the application of relative motion in everyday life. **Reference:** *Martin, George H. 1982. Kinematics and Dynamics of Mechanics, 2nd Edition. McGraw Hill.* **Material:** Listen to an explanation of the relative motion of a rigid object on the acceleration of the object. Can give examples of the application of relative motion in everyday life. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%

8	UTS	UTS	**Criteria:** Compliance with the answer key **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	UTS 2 X 50		**Material:** Midterm Exam **Literature:**	0%
9	Students are able to understand the simple mechanism of slider-crank and four-bar linkage	1. Able to differentiate slider-crank and four-bar linkage mechanisms 2. Skilled at drawing kinematic diagrams	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** Explanation of the kinematics of a simple slider-crank and four-bar linkage mechanism. **Reference:** *JL Meriam, LG Kraige. 2012. Engineering Mechanics, 7th Edition. John Wiley and Sons Inc.* **Material:** Making kinematic diagrams **References:** *Ferdinand P. Beer, E. Russell Johnston Jr. 2010. Vector Mechanics for Engineers, Static and Dynamics, 9th Edition. McGraw Hill.*	0%
10	Students are able to determine the position of all links in a mechanism	Able to calculate and draw changes in the position of each link in the slider-crank mechanism and four-bar linkage	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		**Material:** Explanation of how to calculate changes in position for each link. **Library:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.* **Material:** Drawing the position of each link in the slider-crank mechanism and four-bar linkage **Reader:** *David H. Myszka. 2012. Machines and Mechanisms Applied Kinematic Analysis, 4th Edition. Prentice Hall Inc.*	0%

11	Students are able to relate linear speed and angular speed and are able to use the relative speed method in the slider-crank mechanism	Able to calculate and draw the speed of each point on the slider-crank mechanism	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** Drawing the speed vector of a slider-crank mechanism. **Reference:** *Martin, George H. 1982. Kinematics and Dynamics of Mechanics, 2nd Edition. McGraw Hill.*	0%
12	Students are able to relate linear speed and angular speed and are able to use the relative speed method in the four-bar linkage mechanism	Able to calculate and draw the speed of each point on the four-bar linkage mechanism	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Discussion and questions and answers 2 X 50		**Material:** Drawing the speed vector of the four-bar linkage mechanism. **Reference:** *David H. Myszka. 2012. Machines and Mechanisms Applied Kinematic Analysis, 4th Edition. Prentice Hall Inc.*	0%
13	Students are able to use the relative acceleration method on the slider-crank mechanism	Able to calculate and draw acceleration diagrams for each point on the slider-crank mechanism	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** Drawing the acceleration vector of the slider-crank mechanism. **Reference:** *Ferdinand P. Beer, E. Russell Johnston Jr. 2010. Vector Mechanics for Engineers, Static and Dynamics, 9th Edition. McGraw Hill.*	0%
14	Students are able to use the relative acceleration method in the four-bar linkage mechanism	Able to calculate and draw acceleration diagrams for each point on the four-bar linkage mechanism	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Discussion and questions and answers 2 X 50		**Material:** Drawing the acceleration vector of a four-bar linkage mechanism. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%

15	Students are able to understand speed and acceleration in the Corriolis mechanism	Able to draw velocity and acceleration diagrams of Corriolis bodies	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	Caramah, discussion and questions and answers 2 X 50		**Material:** Drawing the velocity and acceleration vectors of the Corriolis body. **Reference:** *RC Hibbeler. 2010. Engineering Mechanics: Dynamics, 12th Edition. Prentice Hall Inc.*	0%
16	UAS	UAS	**Criteria:** Compliance with the answer key **Form of Assessment** : Participatory Activities	UAS 2 X 50		**Material:** Final Semester Exam **Literature:**	0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
		0%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.