	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
Machine Element 2	2120102133	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	4	August 10, 2022

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

Program Objectives (PO)

PO - 1	Ability to Identify specific facts about mathematics, science, and engineering that are needed for specific situations (What knowledge is needed. Able to transform real-world situations into models appropriate to related courses. Able to demonstrate the appropriate use of specific facts of mathematics, science, and techniques to obtain performance behavior given certain inputs
PO - 2	Able to obtain data about appropriate variables in the field of Mechanical Engineering. Able to compare experimental data and results with appropriate theoretical models. Be able to explain observed differences between models and experiments. 3.a. Able to formulate problems (identify
PO - 3	Ability to establish criteria for solutions in the evaluation process. Able to produce alternative solutions. Able to create prototypes and performance analysis of CPL Correlation with CPMK. Able to improve (improvise) a prototype

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3

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																

Short Course Description: This course contains about Connections • Classification of Connections • Fixed Connections (Rivets, Bolts, Welds) • Moving Connections • Bearings (rolling, sliding) • Mechanical Power Transmission Springs • Types of Power Transmission • Speed Ratio • Shaft Design • Belts, chains , power screw • Brake system • Fixed clutch (coupling) and friction clutch (clutch) • Gears (system, geometry, straight, beveled, conical gears, etc.) • Shaft connections: pin, pin, spline, shrink fit • Lubrication Standard & Code • Introduction to Standard & Code • Selection of Machine Elements based on Industrial Catalog

References

Main :

1. Sularso, Kiyokatso Suga ; Dasar Perencanaan dan pemilihan elemen mesin, P.T. Pradnya Paramita Jakarta , 1983.
2. Spotts. MF, Design of machine of Element, Prentice hall , USA, 2000.
3. Shigley Mischke, Mechanical Engineering Design, McGraw Hill, USA, 2000.

Supporters:

1. Supadi Hs, Buku ajar Elemen Mesin, Jurusan T.Mesin F.Teknik UNESA, Surabaya 2008.

Supporting lecturer: Novi Sukma Drastiawati, S.T., M.Eng.
Dany Iman Santoso, S.T., M.T.
Ahmad Saepuddin, S.T., M.Sc.

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 explain the understanding of permanent and non-permanent connections	1. Explain the classification of connections 2. Explains permanent and non-permanent connections 3. Perform calculations of permanent and non-permanent connections	**Criteria:** 1. see rubric 2. Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities, Portfolio Assessment	2 X 50 response discussion lecture		**Material:** connection calculations **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.* **Material:** calculation of permanent and non-permanent connections **References:** *Sularso, Kiyokatso Suga; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	2%
2	1. Students are able to explain the understanding of permanent and non-permanent connections 2. Students can calculate permanent and non-permanent connections	1. 1. Explain permanent connections. 2. 2. Calculate permanent and non-permanent connections	**Criteria:** 1. see rubric 2. Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities, Portfolio Assessment	3 X 50 response discussion lecture		**Material:** calculation of permanent and non-permanent connections **References:** *Sularso, Kiyokatso Suga; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	4%
3	1. Students are able to explain the understanding of permanent and non-permanent connections 2. Students can calculate permanent and non-permanent connections	1. 1. Explain permanent connections. 2. 2. Calculate permanent and non-permanent connections	**Criteria:** 1. see rubric 2. Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities, Portfolio Assessment	2 X 50 response discussion lecture		**Material:** calculation of permanent and non-permanent connections **References:** *Sularso, Kiyokatso Suga; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%
4	1. Students are able to explain the understanding of permanent and non-permanent connections 2. Students can calculate permanent and non-permanent connections	1. 1. Explain permanent connections. 2. 2. Calculate permanent and non-permanent connections	**Criteria:** 1. see rubric 2. Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities	2 X 50 response discussion lecture		**Material:** calculation of permanent and non-permanent connections **References:** *Sularso, Kiyokatso Suga; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%

5	Students are able to explain their understanding of fixed clutches Students are able to explain their understanding of fluid couplings Students are able to explain their understanding of cone clutches Students are able to explain their understanding of fluid clutches	1. Explain about fixed clutch2. Explain about fluid coupling 3. Explain about cone clutch 4. Explaining the friwil5 clutch. Explain the planning of a fixed clutch 6. Explain the planning of fluid couplings7. explain the planning of cone couplings8. explain the planning of the friwil clutch9. Determine the fluid coupling number10. Determining the size of the fixed clutch11. Determine the force acting on the cone and friwil clutch	**Criteria:** 1.see rubric 2.Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities	LecturesDiscussionsResponsesDoing questions in class 2 X 50		**Material:** Explaining and calculating clutches **References:** *Sularso, Kiyokatso Suga; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%
6	Students are able to understand the concept of glide bearings Students are able to classify glide bearings Students are able to explain the use of glide bearings Students are able to explain the properties of materials used for glide bearings Students are able to plan glide bearings	Students are able to explain the concept of glide bearings Students are able to explain the classification of glide bearings Students are able to describe the use of glide bearings Students are able to describe the properties of glide bearings applied to problems Students are able to complete calculations in designing glide bearings	**Criteria:** 1.see rubric 2.Score criteria: Special: 90 to 100; Very good: 76 to 89; Average: 56 to 75; Below average: 0 to 55 **Form of Assessment** : Participatory Activities	lecture discussion response 2 X 50		**Material:** explaining and calculating bearings **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%
7	Students are able to understand the concept of glide bearings Students are able to classify glide bearings Students are able to explain the use of glide bearings Students are able to explain the properties of materials used for glide bearings Students are able to design glide bearings	Students are able to explain the concept of glide bearings Students are able to explain the classification of glide bearings Students are able to describe the use of glide bearings Students are able to describe the properties of glide bearings applied to problems Students are able to complete calculations in designing glide bearings	**Criteria:** see rubric **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Tests	2 X 50 response discussion lecture		**Material:** calculating bearings **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%

8	sub summative exam	sub summative exam	**Criteria:** see rubric **Form of Assessment** : Participatory Activities, Tests	do the 2 X 50 problem		**Material:** UTS **Bibliography:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.* **Material:** UTS **Bibliography:** *Shigley Mischke, Mechanical Engineering Design, McGraw Hill, USA, 2000.* **Material:** UTS **Library:** *Supadi Hs, Textbook on Mechanical Elements, Department of Mechanical Engineering, Faculty of Engineering, UNESA, Surabaya 2008.*	15%
9	Students are able to understand the concept of rolling bearings Students are able to classify rolling bearings Students are able to understand the elements of rolling bearings Students are able to understand the materials used for rolling bearings Students are able to understand the design concept of rolling bearings	Students are able to explain the concept of rolling bearings Students are able to explain the classification of rolling bearings Students are able to describe the elements of rolling bearings Students are able to choose the right material for rolling bearings based on existing problems Students are able to calculate when designing rolling bearings	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecture discussion response 2 X 50			5%
10	Students are able to understand the concept of rolling bearings Students are able to classify rolling bearings Students are able to understand the elements of rolling bearings Students are able to understand the materials used for rolling bearings Students are able to understand the design concept of rolling bearings	Students are able to explain the concept of rolling bearings Students are able to explain the classification of rolling bearings Students are able to describe the elements of rolling bearings Students are able to choose the right material for rolling bearings based on existing problems Students are able to calculate when designing rolling bearings	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecture discussion response 2 X 50			5%

11	Students are able to understand single block brakes Students are able to understand the application of single block brakes in problems related to mechanical engineering Students are able to understand the parts of single block brakes Students are able to understand how single block brakes work Students are able to understand the design concept of single block brakes	Students are able to explain the concept of a single block brake Students are able to explain the application of a single block brake Students are able to describe the parts of a single block brake Students are able to apply how a single block brake works Students are able to carry out calculations for the design concept of a single block brake	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecture discussion response 2 X 50			5%
12	Students are able to understand single block brakes Students are able to understand the application of single block brakes in problems related to mechanical engineering Students are able to understand the parts of single block brakes Students are able to understand how single block brakes work Students are able to understand the design concept of single block brakes	Students are able to explain the concept of a single block brake Students are able to explain the application of a single block brake Students are able to describe the parts of a single block brake Students are able to apply how a single block brake works Students are able to carry out calculations for the design concept of a single block brake	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecture discussion response 3 X 50			5%
13	Students are able to understand the concept of double block brakes Students are able to understand the elements of double block brakes Students are able to understand how double block brakes work Students are able to understand the design concept of double block brakes	Students are able to explain the concept of double block brakes Students are able to describe the elements of double block brakes Students are able to apply how double block brakes work through design concepts Students are able to calculate the power acting on double block brakes	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecture discussion response 2 X 50		**Material:** brake calculations **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%
14	Students are able to understand the concept of drum brakes Students are able to understand the classification of drum brakes Students are able to understand the parts of drum brakes Students are able to understand the materials used in drum brakes Students are able to calculate the actual force on drum brakes	Students are able to explain the concept of drum brakes Students are able to describe the classification of drum brakes Students are able to describe the parts of drum brakes based on predetermined classifications Students are able to choose the right material for drum brakes according to the classification determined Students are able to complete calculations to find the actual force on drum brakes Students are able to apply calculations drum brakes for drum brake design concepts	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecturediscussionresponse 2 X 50		**Material:** brake calculations **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	5%

15	Students are able to understand the concept of drum brakes Students are able to understand the classification of drum brakes Students are able to understand the parts of drum brakes Students are able to understand the materials used in drum brakes Students are able to calculate the actual force on drum brakes	Students are able to explain the concept of drum brakes Students are able to describe the classification of drum brakes Students are able to describe the parts of drum brakes based on predetermined classifications Students are able to choose the right material for drum brakes according to the classification determined Students are able to complete calculations to find the actual force on drum brakes Students are able to apply calculations drum brakes for drum brake design concepts	**Criteria:** see rubric **Form of Assessment** : Participatory Activities	lecturediscussionresponse 2 X 50		**Material:** brake calculations **References:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.*	3%
16	Summative exam		**Form of Assessment** : Test	work on questions 1 x 90 minutes		**Material:** UAS **Literature:** *Sularso, Kiyokatso Suga ; Basic Planning and selection of machine elements, PT Pradnya Paramita Jakarta, 1983.* **Material:** UAS **Reference:** *Shigley Mischke, Mechanical Engineering Design, McGraw Hill, USA, 2000.*	20%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	62.67%
2.	Portfolio Assessment	7.17%
3.	Test	29.17%
		99.01%

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.