	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 Planning	2120102061	Compulsory Study Program Subjects	**T=2**	**P=0**	**ECTS=3.18**	5	January 4, 2021

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	PLO-5	Work independently and in groups
	PLO-8	Communication
	Program Objectives (PO)	
	PO - 1	• Able to identify the global, economic, environmental and social context of engineering problems
	PO - 2	Able to identify the necessary techniques, skills and tools of modern engineering practices for specific situations
	PO - 3	Able to explain the impact of engineering decisions in a global, economic, environmental and social context
	PO - 4	Able to plan projects related to Industrial Problems in the field of Mechanical Engineering
	PO - 5	Able to apply selected techniques, skills and tools of modern engineering practices to given situations
	PO - 6	Able to complete and evaluate projects in the form of research results or prototypes
	PO - 7	Able to deliver presentations orally

PLO-PO Matrix

P.O	PLO-5	PLO-8
PO-1	✔	
PO-2	✔	
PO-3	✔	✔
PO-4	✔	
PO-5	✔	
PO-6	✔	
PO-7		✔

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																
PO-5																
PO-6																
PO-7																

Short Course Description	The PEM course is a course that provides learning experience and competency to work on a project, especially on an auxiliary machine (Appropriate Technology) and produces output in the form of a prototype in the form of a scale or simulation	
References	**Main :**	

	1. Mott Robert L. 2009. Elemen-Elemen Mesin dalam Perancangan MekanisEdition 2nd. Yogyakarta: ANDI. 2. Mott Robert L. 2004. Machine Elements in Mechanical Design Edition 4th. United State of America: Pearson Prentice Hall.
	Supporters:
	1. https://www.teachengineering.org/populartopics/designprocess 2. Mesin Pengolah Sari Kedelai (PKM FT 2023) 3. Mesin Pres Topi Boni Dengan Sistem Pneumatic (PKM FT 2023) 4. Mesin Pemotong Ring Gelas (PKM FT 2023)
Supporting lecturer	Prof. Dr. Ir. I Wayan Susila, M.T. Prof. Dr. Muhaji, S.T., M.T. Agung Prijo Budijono, S.T., M.T. Ir. Priyo Heru Adiwibowo, S.T., M.T. Dr. Aris Ansori, S.Pd., M.T. Mochamad Arif Irfa'i, S.Pd., M.T. Akhmad Hafizh Ainur Rasyid, S.T., 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	1.Understand how to explore ideas or thoughts 2.Understand how to ask critical questions in design	1.Able to explore ideas or notions 2.Able to ask critical questions in design	**Criteria:** according to the assessment rubric guidelines **Form of Assessment** : Participatory Activities	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Ask stages **Library:** *https://www.teachengineering.org/...*	5%
2	1.Understand how to explore ideas or thoughts 2.Understand how to ask critical questions in design	1.The depth of ideas or ideas 2.The appropriateness of critical questions in design	**Criteria:** according to the assessment rubric guidelines **Form of Assessment** : Participatory Activities	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Ask stages **Library:** *https://www.teachengineering.org/...*	5%
3	Able to dig up information about solutions and technology as needed	Ability to dig up information about solutions and technology as needed	**Criteria:** according to the assessment rubric guidelines **Form of Assessment** : Practice / Performance	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Research the problems **Library:** *https://www.teachengineering.org/...*	5%
4	Able to dig up information about solutions and technology as needed	Ability to dig up information about solutions and technology as needed	**Criteria:** according to the assessment rubric guidelines **Form of Assessment** : Practice / Performance	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Research the problems **Library:** *https://www.teachengineering.org/.....* **Material:** information about solutions and technology according to needs **Reference:** *Soybean Juice Processing Machine (PKM FT 2023)* **Material:** information about solutions and technology according to needs **Reference:** *Boni Hat Pressing Machine with Pneumatic System (PKM FT 2023)* **Material:** information about solutions and technology according to needs **Reference:** *Glass Ring Cutting Machine (PKM FT 2023)*	5%
5	Develop solutions to problems	1.Can brainstorm ideas 2.Produce solutions to problems	**Criteria:** according to the assessment rubric **Form of Assessment** : Practice / Performance	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Develop Possible Solutions **Library:** *https://www.teachengineering.org/...*	5%
6	1.Able to choose solutions to problems 2.Able to do planning	Determine the solution to the problem	**Criteria:** According to the scoring guidelines and presentation rubric, full marks are obtained if you do all the questions well and correctly **Form of Assessment** : Practice / Performance	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** Select a Promising Solution **Library:** *https://www.teachengineering.org/.....*	10%

7	1.Able to choose solutions to problems 2.Able to do planning	1.Produce a schedule of design stage activities 2.Create schematic drawings	**Criteria:** According to the scoring guidelines and presentation rubric, full marks are obtained if you do all the questions well and correctly **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.* **Material:** Select a Promising Solution **Library:** *https://www.teachengineering.org/...*	10%
8	1.Able to choose solutions to problems 2.Able to do planning	1.Determine machine components 2.Calculate machine component specifications 3.Produce working drawings	**Criteria:** According to the scoring guidelines and presentation rubric, full marks are obtained if you do all the questions well and correctly **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.* **Material:** Select a Promising Solution **Library:** *https://www.teachengineering.org/...*	10%
9	Create a prototype	1.Make design results come true with simulations 2.Make design results come to life at scale	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
10	Create a prototype	1.Make design results come true with simulations 2.Make design results come to life at scale	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
11	Create a prototype	1.Make design results come true with simulations 2.Make design results come to life at scale	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
12	Create a prototype	1.Make design results come true with simulations 2.Make design results come to life at scale	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
13	Create a prototype	1.Make design results come true with simulations 2.Make design results come to life at scale	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** machine element planning **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
14	1.Able to carry out prototype performance tests 2.Able to evaluate prototype performance test results	Able to carry out prototype performance tests with appropriate tools	**Criteria:** according to the assessment rubric **Form of Assessment** : Assessment of Project Results / Product Assessment, Practices / Performance	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** design of machine elements **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	10%

15	1. Able to carry out prototype performance tests 2. Able to evaluate prototype performance test results	Able to evaluate measurable prototype performance test results	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions and assignments 2 X 50	Lectures, discussions and assignments 2 X 50	**Material:** design of machine elements **Reference:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%
16	Presenting the design results	Present the results of the design well	**Criteria:** according to the assessment rubric **Form of Assessment** : Project Results Assessment / Product Assessment, Test	Presentation 2 X 50	Presentation 2 X 50	**Material:** Final assessment **Bibliography:** *Mott Robert L. 2009. Machine Elements in Mechanical Design 2nd Edition. Yogyakarta: ANDI.*	5%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	10%
2.	Project Results Assessment / Product Assessment	57.5%
3.	Practice / Performance	30%
4.	Test	2.5%
		100%

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.