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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Welding Technology	8320302193	Bachelor of Mechanical Engineering Education	T=2	P=0	ECTS=3.18	2	July 17, 2024

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	Explains the principles and process of welding using ppt and video media
PO - 2	Explain what materials can be welded

PLO-PO Matrix

P.O
PO-1
PO-2

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																

Short Course Description	This course provides students with a comprehensive understanding of the principles, functions and processes of welding, history and development of welding technology, Acetylene welding, Lintrik arc welding, MIG welding, TIG welding, main welding equipment, auxiliary equipment, personal protective equipment (PPE), welding joints. , electrode codes, welding symbols, welding positions, criteria for good welding results, various weld defects and their anticipation, as well as techniques for checking weld results.

References

Main :

1. Alip,Mochamad (1987).Teori dan Praktek Las.Jakarta: Depdikbud Irjen Dikti p2 LPTK
2. Kenyon,W.,Ginting,Dines (1985).Dasar-Dasar Pengelasan.Jakarta: PradnyaParamita.
3. Sriwidarto (1987).Petunjuk Kerja Las.Jakarta:Pradnya Paramita
4. Sumanto. (1994). Pengetahuan Bahan (untuk Mesin danListrik),Yogyakarta Andi Offset.Smith,
5. Dave (1984).WeldingSkills and Technology. Nem York:McGraw-Hill.
6. Wiryosumarto ,Harsono, (1999).Teknologi Pengelasan Logam.Jakarta:Pradnya Paramita

Supporters:

1. Wiryosumarto ,Harsono, (1999).Teknologi Pengelasan Logam.Jakarta:Pradnya Paramita

Supporting lecturer	Dr. Dewanto, M.Pd.

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. Students are able to describe the principles of welding 2. Students are able to describe the history of welding 3. Able to explain the welding process	- Describe the definition of welding - Describe the history of welding - Describe the development of welding technology	**Criteria:** 1. Report assessment criteria: 2. a. Compliance with reporting format 3. b. Results of analysis of the articles read 4. b. Conclusions and suggestions are prepared 5. Essay test criteria: Compliance with the answer key 6. Participation assessment: Attendance and activeness in lectures **Form of Assessment** : Participatory Activities, Tests	Lectures, discussions, questions and answers, and assignments 2 X 50	Lectures, discussions, questions and answers, and assignments	**Material:** Understanding welding **Reference:** *Sriwidarto (1987). Welding Work Instructions. Jakarta: Pradnya Paramita* **Material:** Welding principles **Library:** **Material:** Development of welding technology **Reader:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita*	100%
2	Students are able to describe the development of welding technology	- Describe the definition of welding - Describe the history of welding - Describe the development of welding technology	**Criteria:** 1. Report assessment criteria: 2. a. Compliance with reporting format 3. b. Results of analysis of the articles read 4. b. Conclusions and suggestions are prepared 5. Essay test criteria: Compliance with the answer key 6. Participation assessment: Attendance and activeness in lectures	Lectures, discussions, questions and answers, and assignments 2 X 50		**Material:** History of the Development of Welding Technology **Library:** *Alip, Mochamad (1987). Theory and Practice of Welding. Jakarta: Depdikbud Inspector General of Higher Education p2 LPTK*	0%
3	- Students are able to understand various types of welding	- Describe various types of welding based on electric heat - Describe various types of welding based on heat and a combination of electric flame and inert gas	**Criteria:** 1. a. Structured tasks 2. - Conformity with reporting format 3. - Results of analysis of the articles read 4. - Conclusions and suggestions are prepared 5. b. UTS: Essay written test according to answer key 6. c. US: Conformity essay writing test with answer key 7. d. Participation 8. - Presence 9. - Active in question and answer, 10. - Seriousness in attending lectures	- Lectures, discussions, questions and answers, and 2 X 50 assignments		**Material:** Types of welding based on electric heat sources. **Reference:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita* **Material:** Types of welding based on heat sources combining electric flame and gas. **Reference:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita*	0%

4	- Students are able to understand various types of welding	- Describe various types of welding based on electric heat - Describe various types of welding based on heat and a combination of electric flame and inert gas	**Criteria:** 1.a. Structured tasks 2.- Conformity with reporting format 3.- Results of analysis of the articles read 4.- Conclusions and suggestions are prepared 5.b. UTS: Essay written test according to answer key 6.c. US: Conformity essay writing test with answer key 7.d. Participation 8.- Presence 9.- Active in question and answer, 10.- Seriousness in attending lectures	- Lectures, discussions, questions and answers, and 2 X 50 assignments		**Material:** Students are able to understand various types of welding. **Reference:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita* **Material:** Types of welding based on electric heat sources **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%
5	Students understand the principles, equipment and process of electric arc welding (SMAW)	Describe the definition of electric arc welding Describe how to start electric arc welding Describe how to start electric arc welding Identify types and functions of flux on electrodes Identify types of electrodes Identify types and functions of electric arc welding equipment	**Criteria:** 1.Report results 2.Report format 3.Contents of the report 4.Conclusion 5.bibliography 6.Compliance with the answer key 7.list of attendees 8.Student participation records/activity journals	Lectures, discussions, questions and answers, and assignments 2 X 50		**Material:** Main, supporting and personal protective equipment in electric arc welding (SMAW) **Library:** *Kenyon, W., Ginting, Dines (1985). Basics of Welding. Jakarta: PradnyaParamita.* **Material:** Names, Functions and Techniques for using supporting tools and PPE in welding **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%
6	Students understand the principles, equipment and process of electric arc welding (SMAW)	Describe the definition of electric arc welding Describe how to start electric arc welding Describe how to start electric arc welding Identify types and functions of flux on electrodes Identify types of electrodes Identify types and functions of electric arc welding equipment	**Criteria:** 1.Task results: Compliance with reporting format 2.Results of analysis of the articles read 3.Conclusions and suggestions are prepared 4.Essay writing test: Compliance with the answer key 5.Participation : 6.Presence 7.Activeness in questions and answers, seriousness in attending lectures	Lectures, discussions, questions and answers, and assignments 2 X 50		**Material:** Working principles of tools and techniques for use in the welding process. **Reference:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita* **Material:** Working principles of tools and techniques for their use in the welding process **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%

7	Students understand the principles, equipment and process of electric arc welding (SMAW)	Describe the definition of electric arc welding Describe how to start electric arc welding Describe how to start electric arc welding Identify types and functions of flux on electrodes Identify types of electrodes Identify types and functions of electric arc welding equipment	**Criteria:** 1.Task results: Compliance with reporting format 2.Results of analysis of the articles read 3.Conclusions and suggestions are prepared 4.Essay writing test: Compliance with the answer key 5.Participation : 6.Presence 7.Activeness in questions and answers, seriousness in attending lectures	Lectures, discussions, questions and answers, and assignments 2 X 50		**Material:** Definition and working principles of electric arc welding **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita* **Material:** electric arc welding techniques. **Reference:** *Dave (1984). Welding Skills and Technology. New York:McGraw-Hill.*	0%
8	Midterm exam	Conformity essay writing test with answer key	**Criteria:** 1.Format compatibility 2.Conformity of the contents of the report with the tasks carried out 3.Conclusion of the report results 4.Compliance with the answer key 5.Presence 6.Activeness in questions and answers, seriousness in attending lectures **Form of Assessment** : Test	Written Test 2 X 50		**Material:** Material that has been discussed from the first to the seventh meeting **. References:**	0%
9	Students are able to understand the types of acetylene welding (OAW)	Describe the definition of acetyline welding. Identify the types and functions of acetyline welding equipment. Describe acetyline welding techniques. Describe how to ignite acetyline welding. Identify additives in acetyline welding.	**Criteria:** 1.Format compatibility 2.Conformity of the contents of the report with the tasks carried out 3.Conclusion of the report results 4.Compliance with the answer key 5.Presence 6.Activeness in questions and answers, seriousness in attending lectures	Lectures, discussions, questions and answers, and assignments 2 X 50		**Material:** Understanding acetylene welding **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita* **Material:** How to make carburizing, neutral and oxidation flames **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%
10	Students are able to use welding symbols and signs to design the welding process			Lectures, group divisions, assignments, discussions, questions and answers and assignments	Lectures, group divisions, assignments, discussions, questions and answers and assignments	**Material:** welding symbols **Library:** **Material:** welding position **Reference:**	0%
11	Students are able to assess and analyze welding results			Lectures, discussions, questions and answers, and assignments		**Material:** Criteria for good welding results **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita* **Material:** Weld defects and their anticipation **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%

12	Students understand deformation and how to prevent it in the welding process			Lectures, discussions, questions and answers, and assignments		**Material:** Deformation and its prevention in the welding process **References:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita*	0%
13	Students understand the various types of Personal Protective Equipment (PPE) or work safety equipment and their functions		**Form of Assessment** : Portfolio Assessment			**Material:** Various types of personal protective equipment in flame arc welding (electric welding) **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita* **Material:** Various types of self-protection equipment in acetylene welding **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%
14	Students understand the various types of Personal Protective Equipment (PPE) or work safety equipment and their functions		**Form of Assessment** : Portfolio Assessment	Lectures, discussions, questions and answers, and assignments		**Material:** Various types of personal protective equipment in flame arc welding (electric welding) **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita* **Material:** Various types of self-protection equipment in acetylene welding **Reference:** *Sriwidarto (1987). Jakarta Welding Work Instructions: Pradnya Paramita*	0%
15	Students understand how to inspect weld results	1. Explain the techniques for checking destructive weld results 2. Explain non-destructive weld inspection techniques		Lectures, discussions, questions and answers, and assignments		**Material:** Welding results inspection techniques **References:** *Wiryosumarto, Harsono, (1999). Metal Welding Technology. Jakarta: Pradnya Paramita* **Material:** Example of inspection of destructive and non-destructive weld results. **Reference:**	0%
16	Final exams	Conformity essay writing test with answer key	**Form of Assessment** : Portfolio Assessment	writing test		**Material:** Material discussed at meetings VIII to XV **References:**	0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	50%
2.	Test	50%
		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.