



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																																																																																																															
Manufacturing Process II	2120102078		T=2 P=0 ECTS=3.18	4	July 16, 2024																																																																																																															
AUTHORIZATION	SP Developer		Course Cluster Coordinator	Study Program Coordinator																																																																																																																
	Ir. Priyo Heru Adiwibowo, S.T., M.T.																																																																																																																
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-7	Problem analysis																																																																																																																		
	PLO-14	Science and engineering knowledge																																																																																																																		
	Program Objectives (PO)																																																																																																																			
	PO - 1	Students have good morals, ethics and personality when attending lectures																																																																																																																		
	PO - 2	Students have knowledge of all types of welding theory including: light arc welding, acetylene welding, MIG welding and TIG welding.																																																																																																																		
	PO - 3	Students have skills in all types of welding theory including: light arc welding, acetylene welding, MIG welding and TIG welding.																																																																																																																		
	PO - 4	Students are able to interact and work together in teams, be responsible, think logically and intelligently in solving problems faced professionally in the welding field																																																																																																																		
	PLO-PO Matrix																																																																																																																			
		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th>P.O</th> <th>PLO-5</th> <th>PLO-7</th> <th colspan="2">PLO-14</th> </tr> <tr> <td>PO-1</td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO-2</td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO-3</td> <td></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>PO-4</td> <td></td> <td></td> <td colspan="2"></td> </tr> </table>				P.O	PLO-5	PLO-7	PLO-14		PO-1					PO-2					PO-3					PO-4																																																																																										
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																																																				
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Short Course Description	Understanding and practice of welding processes in the form of strip welding, overlapping joints, fillet joints, I-joints, V-joints and pipes with underhand, horizontal and vertical welding positions using acetylene welding, electric arc welding and MIG welding, Manufacturing Process Control & Business Processes in Industrial Projects, Design, manufacturing/fabrication, inspection, construction test commissioning for static equipment (boilers, vessels, tanks), Metal Forming (Casting & Forging) for Turbines (Casing, Shaft, Blade Etc.) in manufacturers and Condenser Manufacturing, Design, manufacturing/fabrication, inspection, construction, test commissioning for welding work in sea water (cathodic protection for spiral pipe piles at docks/jetty), Design, manufacturing/fabrication, inspection, construction, test commissioning for utility systems, Manufacturing control /fabrication & construction of non-metallic materials in power plants (refractory, composite) and in piping in household gas networks (polyethylene)																																																																																																																			
References	Main :																																																																																																																			

1. Mikell P. Groover. 2012. Introduction to Manufacturing Processes. John Wiley and Sons.
2. Sindo Kou. 2003. Welding Metallurgy Second Edition. New Jersey: John Wiley and Sons.
3. Harsono Wiryosumarto dan Toshie Okumura. 2000. Teknologi Pengelasan Logam . Jakarta : Pradnya Paramita.
4. Noer Ilman. 2011. Diktat Teknologi Las. Yogyakarta : Universitas Gadjah Mada.
5. Lukas Oka Prasetyawanto. 2012. Ringkasan Materi Sub Bidang Pengelasan SMAW. Serang : Dikdas Teknologi Mekanik Balai Besar Latihan Kerja Industri.
6. Budiharjo dan Novi Sukma Drastiawati. 2014. Job Sheet Las Listrik SMAW. Surabaya : UNESA.

Supporters:

Supporting lecturer
Mochamad Arif Irfai, S.Pd., M.T.
Hanna Zakiyya, 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	Understand the one semester study contract Understand the meaning of the manufacturing process Understand welding as part of the manufacturing process Understand the history of welding Understand the definition of welding Understand the advantages of welding compared to other connection processes Understand the use of welding	Agree to a study contract for one semester Explain the meaning of the manufacturing process Explain the welding process which is part of the manufacturing process Create a welding chart as part of the manufacturing process Explain the history of welding Explain the definition of welding Explain the advantages of welding compared to other connection processes Explain the use of welding in general Explain the use of welding in the industrial world	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, discussions and questions and answers 2 X 50			0%
2	Continuing the 1st meeting (same as the 1st meeting)	Able to explain the history of welding. Explain the definition of welding. Explain the advantages of welding compared to other connection processes	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, discussions and questions and answers 2 X 50			0%
3	Understanding the types of welding Understanding welding methods Understanding the various types of welding joints Understanding liquid chemical welding Understanding oxy acetylene welding (OAW) Understanding thermite welding Understanding electric arc welding Understanding electric resistance welding	Explaining the various types of welding Classifying the various types of welding Explaining welding methods Describing welding methods Explaining liquid chemical welding Explaining OAW welding Describing how OAW welding works Explaining thermite welding Explaining SMAW welding Describing the SMAW welding process Explaining the definition of MIG and TIG welding Describe the welding process	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, discussions, questions and answers, and problem solving (case studies) 2 X 50			0%

4	Understanding friction welding Understanding energy beam welding Understanding heat transfer in welding Understanding the calculation of heat input and heat output in welding	Explain friction welding Describe the friction welding method Define various types of friction welding Explain energy beam welding Define energy beam welding Explain heat transfer in the welding process Describe heat transfer in the welding process	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric	Lectures, discussions, questions and answers, and 2 X 50 case studies		0%
5	Understanding welding electrodes Understanding welding on several types of metal	Explaining the various types of welding electrodes Explaining how to determine welding electrodes Explaining how to read symbols on welding electrodes Explaining welding on several types of metal Explaining welding capabilities on metal alloys	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric	Lectures, discussions, questions and answers, and 2 X 50 case studies		0%
6	Understanding the types of welding joints Understanding welding positions Understanding defects in welding	Explain all types of welding joints Describe the types of welding joints Explain welding positions Describe welding positions Explain weld defects Classify weld defects Describe weld defects	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, discussions and questions and answers 2 X 50		0%
7	Understand the welding planning process. Understand work safety in welding	Explain the welding planning process Explain the correct welding planning procedure Explain work safety when welding Explain the safety equipment that must be needed when welding Explain some of the dangers of welding that do not comply with procedures	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric	Lectures, discussions, questions and answers, and 2 X 50 case studies		0%
8	Understand welding procedures and techniques	Explain welding procedures Explain welding techniques Explain welding preparation in detail	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, discussions, questions and answers, and 2 X 50 case studies		0%

9	midterm exam	midterm exam	Criteria: midterm exam	midterm exam 2 X 50			0%
10	Understand how to control Manufacturing Processes & Business Processes in EPC Projects at PT. Adhi Karya	Able to control Manufacturing Processes & Business Processes in EPC Projects at PT. Adhi Karya	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric	Lectures, discussions, questions and answers, and 2 X 50 case studies			0%
11	Understand how to design, manufacture/fabricate, inspection, construction, test commissioning for static equipment (boilers, vessels, tanks)	Understand how to design, manufacture/fabricate, inspection, construction, test commissioning for static equipment (boilers, vessels, tanks)	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	Lectures, Discussions and Practicum 2 X 50			0%
12	Understand how to form metal (casting & forging) for turbines (casing, shaft, blade, etc.) in manufacturers and condenser manufacturing	Able to perform metal forming (Casting & Forging) for turbines (casing, shaft, blade, etc.) in manufacturers and condenser manufacturing	Criteria: The weight of the assessment results of 20% is obtained from the level of student participation both in terms of attendance at lectures, activeness in attending lectures (asking questions, paying attention, and being serious), and activeness in group discussion activities and class presentations. The following is a class presentation rubric.	practical discussion 2 X 50			0%
13	Understand how to design, manufacture/fabricate, inspection, construction, test commissioning for welding work in sea water (cathodic protection for spiral pipe piles in docks/jetty)	Able to carry out design, manufacturing/fabrication, inspection, construction, test commissioning for welding work in sea water (cathodic protection for spiral pipe piles in docks/jettys)	Criteria: The maximum score is if the student is able to set the tool, turn on the tool, and make a good welding line	Practical Discussion 2 X 50			0%
14	Understand how to design, manufacture/fabrication, inspection, construction, test commissioning for utility systems (WTP & WWTP)	Able to carry out design, manufacturing/fabrication, inspection, construction, test commissioning for utility systems (WTP & WWTP)	Criteria: The maximum score is obtained if the student is able to carry out the practicum well	Practical Discussion 2 X 50			0%
15	Understand how to control manufacturing/fabrication & construction of non-metallic materials in power plants (refractory, composite) and in piping in household gas networks (polyeteline)	Able to control manufacturing/fabrication & construction of non-metallic materials in PLTU (refractory, composite) and in piping in household gas networks (polyeteline)	Criteria: The maximum score is obtained if the student is able to carry out the practicum well	Practical Discussion 2 X 50			0%
16							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.