MODULE HAND BOOK

MECHANICAL ENGINEERING VOCATIONAL EDUCATION STUDY PROGRAM

FACULTY OF ENGINEERING – UNIVERSITAS NEGERI PADANG

COURSE NAME	CODE	Course classification	CU		Sem	Version
			Theory	Pract		
Welding Quality Testing	MES2.61.6103	Compulsory Courses/ profiency	1	2	6	
Responsible	Drs. Purwantono, M.Pd, Drs. Irzal, M. Kes, Junil Adri, M.Pd.T		SIgnature			

INFORMATION	**Dean**	**Head of Department**	**Coordinator of study program**
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Program Learning Outcome	**Program learning outcome of Mechanical engineering vocational education:**
	1. Possess a good ability to apply the basic science (mathematics and natural sciences) and other disciplines in profesional jobs / projects (Knowledge-understanding) 1.1. possess a good understanding and can apply the basic concept of mathematics to solve various technical problems 1.2. possess a good understanding and can apply basic the concept of physic to solve various technical problems 1.3. possess a good understanding and can apply basic the concept of chemistry to solve various technical problems 2. Possess a critical and creative thingking in identifying, formulating, problem solving and evaluating various problems in mechanical engineering using the most appropriate and effective scientific method ***(Engineering analysis, investigations and assessment):*** 2.1. problem identification skills

2.2. problem analysis skills
2.3. problem evaluation skills

3. Possess a good ability in designing, manufacturing and operating machines ***(Engineering design)***
   3.1. able to formulate ideas/concepts into a technical drawing, design and budget plans
   3.2. able to operate various machines and other engineering equipment with the correct standard operating procedure
   3.3. able to design a machine or machinery system based on a valid scientific theory
   3.4. able to realize a concept/design into a prototype, manufacturing process and engineering system
4. Possess a good ability to design, organize and evaluate the education and learning process in *mechanical engineering vocational education.* ***(Education design)***
   4.1. able to design curriculum and learning process by considering various aspects
   4.2. able to organize, control, evaluate and improve the quality of the learning process
   4.3. able to develop an interesting, effective and efficient learning medias
5. Possess a good ability to adapt to development in science and technology and apply it into professional jobs by considering any non-technical aspects. ***(Engineering practice)***
   5.1. able to innovate and develop technology in the field of mechanical engineering by considering social, economic and environmental aspects
   5.2. able to carry out the optimization process and increase the efficiency of machines or machining system.
   5.3. able to improve the performance of machine/ machinery system by applying the information technology
6. Possess a good softskil and spirit of lifelong learning ***(Transferable skill / softskill)***
   6.1. possess a religious character
   6.2. possess a spirit of nasionalisme, social sensitivity and environmental consevation orientation
   6.3. possess the ability to communicate effectively and work together in teamwork
   6.4. possess the ability to transfer science and technology to society to improve the quality of life
   6.5. possess a good characters of entrepreneur

Course learning outcomes	**Course learning outcomes**

CLO	PLO
1. Students Understand the Characteristics of Metal Welding Results	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2
2. Students Understand Techniques and procedures to check, test and improve weld quality	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2
3. Skilled students check the welding results,welding testing with a variety of testing methods	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2
4. Students Skilled in making welding quality testing teaching materials	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2

Course descriptions	Skilled in performing techniques and procedures for checking, testing and improving welding results in accordance with welding procedure specification (WPS), using a variety of methods. Skilled in making teaching materials for inspection, testing and repair of weld quality	
References	**Main Reference (RU):**	
	1. Fabrication Team (2010) Electric Flame Arc Welding Module 2. The Fabrication Team (2012) Job Practices for Metal Welding Technology 3. Welding Technology	
	Additionl Reference (RP)	
	1. Sonawan, H., Suratman, R., 2004, Introduction to Understanding Metal Welding, Alfa Beta, Bandung. 2. Smith, D., 1984, Welding Skills and Technology, McGraw-Hill, New York.	
Learning Media	**Software:**	**Hardware:**
		Computer, LCD Projector and Whiteboard and peripherals
Team Teaching		
Assessment	Practical results, Mid-Term Exam, Final Exam, Independent & Group Assignments, Group Presentations	
Requirements Subject	Fabrication, Metal Welding Technology	

COURSE SEBJECTS

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
(1)	**CLO-1: [PLO-**2.1, 2.2, 2.3) Students Understand the Characteristics of Metal Welding Results	1. Metal welding process 2. Heat distribution on the weld metal	Lecture [1x200 '] Discussion [1x20 '] Demonstration [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-1,2,3 and RU 2 RP-1,2
(2)	**CLO-1: [PLO-**2.1, 2.2, 2.3) Students are capable Understand and know the metal material being welded	1. Metal and nonmetal materials 2. The carbon content of the metal 3. Electrode code and type	Lecture [1x200 '] Discussion [1x20 '] Demonstration [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-1,2,3 and RU 2 RP-1,2
(3)	**CLO-1: [PLO-**2.1, 2.2, 2.3) Students are able to understand welding procedure specification (WPS)	1. Metal welding techniques and procedures 2. Weld joint symbols	Lecture [1x200 '] Discussion [1x20 '] Demonstration [1x70 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written	RU-1,2,3 and RU 2 RP-1,2
(4)	**CLO-2: [PLO-**.2.1, 2.2, 2.3 Students Understand Techniques and procedures to check, test and improve weld quality	1. Metal welding techniques and procedures 2. Welding preparation, welding and finishing	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum Welding techniques and procedures to check, test and improve weld quality	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(5)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in checking the welding results	1. Inspection of weld results, height, width, weld path, penetration of welds, roots, gaps and others	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum Inspection of weld results, height, width, weld path, penetration of welds,	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
				roots, gaps and others		
(6)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing welds using a visual method	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the weld results with a visual method	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(7)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing the weld results with the Non Destructive test method Flourents	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the results of the weld with the method of Non Destructive (Non Destructive test) Flourents	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(8)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing welding results with the Magnetic Non Destructive test method	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the results of the weld with the method of Non Destructive (Non Destructive test) Magnetic	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(9)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing the weld results with	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
	the destructive method (Destructive test) Bending Test	Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)		Practicum test the results of the weld with the destructive method (Destructive test) Bending test		
(10)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing the results of the weld with the destructive test method (Destructive test) Pull	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the results of the weld with the destructive method (Destructive test) Test Pull	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(11)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing the results of the weld with the destructive method (Destructive test) Hardness Test (Hardness Test)	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Heat distribution on the weld metal 3. Continuse Cooling Transformation (CCT) Diagram)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the results of the weld with the destructive method (Destructive test) Hardness Test (Hardness Test)	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(12)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in testing the welding results with the destructive method (Destructive test) Metallography test	1. Weld result testing methods Destructive and non-destructive methods (Destructive and non Destructive Test) 2. Weld metal metallography 3. Heat distribution on the weld metal 4. Continuse Cooling	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum test the results of the weld with the destructive method (Destructive test) Metallography test	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2

Week	Expected competencies	Topics	Method and strategy for leraning	Assignment	Criterion / Assessment indicattor	References
		Transformation (CCT) Diagram)				
(13)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled in improving the results of the welding method (recovery) heating	1. Welded joint standard 2. WPS (welding Procedure Spesification)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum improve the results of the welding method (recovery) heating	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(14)	**CLO-3: [CP-**3.2, 5.1, 5.2, 5.3, 6.3.**]** College student Skilled at repairing the results of destructive welding methods	1. Welded joint standard 2. WPS (welding Procedure Spesification)	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum fix the welding result of the destructive method	Oral and written and practicum and practicum reports	RU-1,2,3 and RU 2 RP-1,2
(15)	**CLO-4: [CP** 3.1., 3.2.**]** College student Skilled in making welding quality testing learning tools	Learning Media RPS	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum make welding quality testing learning tools	Oral and written and practicum and practicum reports	RU-1,3 and RU 2 RP-1,2
(16)	**CLO-4: [CP** 3.1., 3.2.**]** College student Skilled in making WQPR Results of inspection, testing, welding quality improvement	Welding Qualification Procedure Report.	Lecture [1x50 '] Discussion [1x20 '] Practicum [1x220 '] Conclusion [1x10 ']	Make a summary and description of the material presented in the resume book Practicum WQPR Result of checking, testing, repair of weld quality	Oral and written and practicum and practicum reports	RU-1,3 and RU 2 RP-1,2
	Final Exam					

Note : 1 credit = (50 'TM + 60' BT + 60 'BM) / Week
TM = Face to Face (Lecture)
BT = Structured Learning.
BM = Independent Study
PS = Simulation Practicum (160 minutes / week)
PL = Laboratory Practicum (160 minutes / week)
T = Theory (aspects of science)
P = Practice (aspects of work skills)

The linkage between CLO and PLO and assessment methods

MSN1.62.4007	Assessment	Point (%)	PLO-1			PLO-2			PLO-3				PLO-4			PLO-5			PLO-6				
			1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2	3	4	5
CLO-1,1	UTS. 2.2, 2.3	2				V	V	V															
CLO-1,2	UTS. 2.2, 2.3	2				V	V	V															
CLO-2.1	UTS. 2.2, 2.3	2				V	V	V															
CLO-2,2	UTS. 2..2, 2.3	2				V	V	V															
CLO-2,3	UTS. 2.2, 2.3	2				V	V	V															
CLO-3,1	UAS. 2.2, 2.3	2				V	V	V															
CLO-3,2	UAS. 2.2, 2.3	2				V	V	V															
CLO-3,3	UAS. 2.2, 2.3	2				V	V	V															
CLO-4,1	UAS. 2.2, 2.3	2				V	V	V															
CLO-4,2	UAS. 2.2, 2.3	2				V	V	V															
CLO-3	Practicum	70							V	V	V	V											
Presence		10																					
TOTAL		100																					

Assessment Component

Midterm exam (UTS) : 10%
Final exams (UAS) : 10%
Assignment : 70%
Presence : 10%
Total : 100%

Scoring/Grading level description

	Excellent	**Good**	**Satisfy**	**Fail**
ability to describe	Able to describe correctly and completely	Able to describe correctly but not complete	Able to describe but less clear and incomplete	Unable to describe
ability to formulate	Able to formulate correctly and completely	Able to formulate correctly but not complete	Able to formulate but less clear and incomplete	Unable to formulate
ability to calculate	Able to calculate correctly and completely	Able to calculate correctly but not complete	Able to calculate but less clear and incomplete	Unable to calculate
ability to analyze	Able to analysize correctly and completely	Able to analyze correctly but not complete	Able to analyze but less clear and incomplete	Unable to analyze

Scoring and grading system

Score	**Quality**	**Quality score**	**Designation**	**Score**	**Quality**	**Quality score**	**Designation**
85 – 100	A	4.0	Outstanding	55 – 59	C	2.0	Acceptable
80 – 84	A-	3.6	Excellent	50 – 54	C-	1.6	Poor
75 – 79	B+	3.3	Very good	40 – 49	D	1.0	Poor
70 – 74	B	3.0	Good	≤ 39	E	0.0	Fail
65 – 69	B-	2.6	Good	-	T	-	Postpone
60 – 64	C+	2.3	Acceptable				