

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Diploma Engineering			Branch		Mechanical Engineering		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 2018	
Subject code		1ME2607	Subject Name		Fabrication Technology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:
<p>(1) Students must have clear internal exam of workshop practice and Metal casting forming and joining.</p> <p>(2) Students must have knowledge of workshop technology like metal fitting and different fitting tools, wood working skill and wood working tools, sheet metal working skill and tools, brazing overview, pipe fitting tools, different types of vices, He must have ability to understand different welding process . Students must aware with operator safety and industrial safety guidelines</p>

Course Learning Outcomes:
<p>The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:</p> <p>CO 1. To understand need Welding Technology in mechanical engineering.</p> <p>CO 2. To apply the drawing skill to convert in to production drawing.</p> <p>CO 3. To develop Fabrication skill.</p> <p>CO 4. To implements theory skill in to production.</p> <p>CO 5. To Verify practical model with industrial machinery.</p> <p>The practical should be carried out in such a manner that students are able to acquire different learning</p> <p>Outcomes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.</p>

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 (Introduction.)	1.1 Need and scope of fabrication technology in industries.	1a List the factors affecting weldability.	5	5
	1.2 Weldability-concept, meaning, definition and factors affecting it and its importance.	1b Explain importance of weldability.		
	1.3 Power source-classification, advantages, limitations, features, applications and selection criteria.	1c Compare different power sources.		
	1.4 List of national and international fabrication industries and third party inspection agencies.	1d List national and international level third party agencies.		

<p>UNIT – 2 (Drawing Interpretation)</p>	<p>2.1 Welding location of elements, welding general nomenclature, and welding symbols as per IS: 696-1972, welding supplementary symbols, abbreviations used for welding processes and welding position.</p> <p>2.2 Interpretation and method to work out bill of material for following types of drawings:</p> <p>i. Welding / fabrication. ii. Process and instrumentation. iii. Piping isometric.</p> <p>2.3 Types, sketch, edge preparation and applications of weld - square butt, groove, fillet, plug, Types of joint butt, lap, corner, tee and edge, Types of weld edge preparation</p> <p>2.4 Welding documents - Weld Test Plan (WTP) and Shop Weld Plan (SWP).</p> <p>2.5 Introduction to ASME section IX Welding Procedure Specification (WPS) and Welder Performance Qualification (WPQ).</p> <p>2.6 Need and application areas of different codes used in fabrication industries remaining ASME sections, ASTM, AWS, IS, BIS, JIS, EN, DIN, TEMA, EJMA.</p>	<p>2a. Interpret manufacturing/welding drawings.</p> <p>2b. Prepare bill of materials, parts list and quantity.</p> <p>2c. Explain procedure for weld edge preparation.</p> <p>2d. Develop WPS (Welding Procedure Specification), WPQ (Welder Performance Qualification), WTP (Weld Test Plan) and SWP (Shop Weld Plan) documents.</p> <p>2e. Interpret different terms of code.</p>	<p>15</p>	<p>14</p>
<p>UNIT – 3 (Fabrication Processes and Safety)</p>	<p>3.1 Equipment/machines used for edge preparation, their working & features.</p> <p>3.2 Preheating and inter-pass: need, method and applications.</p> <p>3.3 Post heating-need, method and applications.</p> <p>3.4 Post Weld Heat Treatment (PWHT)- need, methods, applications and selection criteria.</p> <p>3.5 Methods of relieving thermal stresses.</p> <p>3.6 Arc welding parameters-setting criteria:</p> <p>i. Voltage. ii. Current. iii. Welding speed. iv. Welding feed. v. Arc length.</p> <p>3.7 Advance welding methods and their applications.</p> <p>i. Ultrasonic welding. ii. Laser beam welding. iii. Electron beam welding. iv. Friction stir welding.</p>	<p>3b. Select preheating, post heating and PWHT method.</p> <p>3c. Explain different methods of relieving thermal stresses.</p> <p>3d. Set different arc welding parameters.</p> <p>3e. Explain advance welding methods and welding automation.</p> <p>3f. Explain various fabrication procedures.</p> <p>3g. Calculate Ovality, shell plate orientation and arc length.</p> <p>3h. Identify fabrication stages for equipment to be fabricated.</p> <p>3i. Describe safety norms to be followed during fabrication activities.</p>	<p>15</p>	<p>10</p>

	<p>3.8 Welding automation.</p> <p>3.9 Process equipment fabrication procedures:</p> <ul style="list-style-type: none"> i. Plate edge bending and rolling. ii. Weld edge preparation. iii. Marking procedures of shell and dish end. iv. Plate cutting by gas and plasma arc with automation. v. Shell alignment by string and laser beams. vi. Orientation marking on shell for nozzles. vii. Reference line marking by dumpy level. viii. Ovality measurement of shell and it's rectification by spiders. ix. Profile checking by template. x. Circularity measurement by swing arm method. xi. Offset rectification by wedge. xii. Strip cladding and overlay <p>3.10 Fabrication steps/stages of:</p> <ul style="list-style-type: none"> i. Electrical power/communication transmission tower. ii. Pressure vessel. iii. Heat exchanger. <p>3.11 Need, precautions and safety norms during welding and fabrication process.</p>			
<p>UNIT – 4 (Inspection and Testing.)</p>	<p>4.1 Common weld defects, their causes and remedies;</p> <p>4.2 Thermal distortion-concept, meaning, definition, causes, effect and types.</p> <p>4.3 Methods and equipments used to control thermal distortion.</p> <p>4.4 Weld quality-concept, meaning, definition, importance and affecting factors</p> <p>4.5 Introduction to inspection and testing.</p> <p>4.6 Stages of inspection.</p> <p>4.7 Types, methods of testing and importance of destructive testing (DT).(tensile test, compressive test, impact test, bend test, hardness test.)</p> <p>4.8 Types, methods of testing and importance of Non Destructive Testing (NDT). (Liquid penetrate testing, Magnetic Particle Testing, Ultrasonic Testing, Radiography Testing, Eddy Current Testing)</p> <p>4.9 Special types of test like Hydro test, Pneumatic test, and Leak test by soap</p>	<p>4a. Distinguish weld defects and thermal distortion.</p> <p>4b. Identify factors affecting weld quality.</p> <p>4c. Explain testing and inspection procedures.</p>	<p>15</p>	<p>8</p>

	water and helium gas.			
UNIT – 5 (Surface Preparation, Finishing and Coating Methods)	5.1 Surface preparation methods, sand blasting and ball blasting. 5.2 Surface finishing methods, brushing and grinding. 5.3 Surface colour coating by brush, roller and spray applications.	5a. Explain surface preparation, finishing and coating method.	5	4
Unit – VI Installation, Erection and Commissioning.	6.1 Erection steps for common fabrication structure. 6.2 Erection steps for equipment to be fabricated. 6.3 Erection steps for piping. 6.4 Installation and commissioning procedures for plant machineries and fabricated equipment.	6c. Describe steps for erection, installation and commissioning of various fabricated equipment. 6c. Suggest steps for erection, installation and commissioning for given equipment.	5	4
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	2	Interpretation of fabrication drawing: Teacher will issue one fabrication drawing For interpretation. a. For fabrication / welding drawing: Students would: i. Name the item which has been drawn and given for interpretation. ii. Prepare bill of materials. (Parts name, part material, raw material size and quantity). iii. Tabulate welding / fabrication symbols used with interpretation of each.
2	3	Prepare WPS and WPQ: Prepare one WPS (Welding Procedure Specification) and one WPQ (Welder Performance Qualification) based on given variables and data.
3	1-5	Complex job as mini project work: Fabricate one complex job by using welding processes in group of 4 to 6 students, from the following
4	5	Prepare SWP and WTP: Prepare one Shop Weld Plan (SWP) and one Weld Test Plan (WTP) for typical pressure vessel job. a. Sketch the job. b. List the steps followed to prepare plans. c. Prepare plans.
5	6	Liquid penetrate testing: a. Demonstrate liquid penetrate testing of weldment. b. Write specification of test liquid. c. List steps followed. d. Sketch the path tested. e. Write conclusion with interpretation. f. Attach photograph.
List of Instruments/Equipment/Trainer Board		
1	Welding power source rectifier.	

	<ol style="list-style-type: none"> 1. AC input 440 volts, 3 phase, 50 Hz. 2. DC output 115 volts- 230 volts. 3. Output wattage (1 to 5 kW). 		
2	<p>Gas cutting set.</p> <ol style="list-style-type: none"> 1. Acetylene and oxygen gas cylinder. 2. Pressure regulator and gas flow measuring device. 3. Cutting torch with back fire arrester. 4. Various nozzle tip set (2 to 6 mm). 		
Link of Text Books			
No	Title of Books	Authors	Publication
1	Welding technology.	Khanna,O.P	DhanpatRai Publications, New Delhi - 22nd Edition
2	Welding engineering and technology.	Parmar, R.S.	Khanna Publishers, New Delhi - 1st edition
3	Modern arc welding Technology.	Nadkarni, S.V.	Advanioerlikon, Mumbai – 6th edition
List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Structural steel fabrication and erection	Saxena, S.K.; Asthana, R.B.	Somaiya Publishers, New Delhi – 3rd edition
2	Metal cutting science and production technology	Jain, K.C.; Agrawal L.N.	Khanna Publishers, New Delhi -4th edition
Link of Learning Web Resource			
1	https://weldingchamps.com/types-of-welding-processes/		
2	https://nptel.ac.in/courses/112107089/		
3	https://www.canyons.edu/academics/welding/index.php		