MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI

1	Name of Syllabus	**C.C. in Process Plant Mechanical Maintenance and Repairing Of Equipment (307109)**
2	Max. Nos of Student	25 Students
3	Duration	6 Months
4	Type	Full Time
5	Nos Of Days / Week	6 Days
6	Nos Of Hours /Days	7 Hrs
7	Space Required	Laboratory = 1000 Sq feet Class Room = 200 Sq feet TOTAL = 1200 Sq feet
8	Entry Qualification	S.S.C. + any course pass from chemical group
9	Objective Of Syllabus/ introduction	1. Awareness of Safety precautions 2. Knowledge of Engineering skill, use of tools in assembly 3. Awareness of Process Plant. 4. Awareness of Process Plant Mechanical Maintenance and Repairing of Equipment 5. Awareness of Mechanical Maintenance. 6. Awareness of Basic Fitting, Turning & Machining.
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which Develop, Maintain, Repair Process Plant. Work as or with working experience will be in a position to start his own independent Business.
11	Teacher's Qualification	Diploma/Certificate in concern subject
12	Training System	**Training System Per Week** Theory: 12 Hours; Practical: 30 Hours; Total: 42 Hours
13	Exam. System	

Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks
1	**30710911**	Process Plant Mechanical Maintenance and Repairing of Equipment	TH I	3 hrs	100	35
2	**30710921**	Basic Fitting, Turning & Machining	PR I	3 hrs	100	50
3	**30710922**	Process Plant Mechanical Maintenance and Repairing of Equipment	PR II	6 hrs	200	100
		TOTAL			**400**	**185**

Process Plant Mechanical Maintenance and Repairing of Equipment

Topics	*Theory*	*Practical*
1	Use of Measuring Instruments, Micrometer, Vernier caliper, Vernicr micrometer, Depth Micrometer, Dial micro meter, Vernier height gauge.	Use of measuring Instruments according to theory chapter
2	Vernier Bevel protector, Combination set, Sinebar, Dial Test Indicator, Slip Gauge, Angle gauge block	Measurement of taper Job by taper Measuring instruments
3	Maintenance Introduction safety precaution in maintenance shop overhauling of any machine and there maintenance	Overhauling of Machine as lathe milling sapper etc.
4	Maintenance of Pipe line, Pump repairing, Pump shaft coupling and motor shaft coupling alignment	Pipe thread cutting pump motor alignment
5	Maintenance of hydraulic system, Maintenance of pneumatic system, principal and working procurer of hydraulic and pneumatic system	Over hauling of Hydraulic & Pneumatic cylinder
6	Some special machine maintenance as thread cutting, rolling, boring, broaching, sawing , spine cutting NC & CNC machine etc.	Any special machine overhauling
7	Limit, Fit , Tolerance , types of limit, types of fit, types of tolerance , Allowance types of allowance , different types of limit, fit, Terence, system	Sift & bush bearing turning & fitting
8	Terminology of limit, fir, tolerance, definition description of each with sketch, geometrical tolerance	Sift & bush bearing turning & fitting
9	Gauge necessity of gauge, Types of gauge there use and safety, Pluge gauge, ring gauge, snap gauge, thread gauge, wire gauge, radius gauge, filler gauge, telescopic gauge	Job making in fitting shop according to any one gauge

10	Surface finish terminology of surface finish definition description any one with sketch roughness value, Roughness grade and roughness symbol, Explain surface structure with sketch by BIS	Grinding of anyone shaft
11	Heat treatment, Necessity, Terminology of Heat Treatment, Hardening, Tempering, Annealing, Normalizing, Case Hardening different types of case hardening methods	Flame hardening of MS Shaft
12	Power Transmission, Necessity , Advantage, Types of power Transmission belt , types of belts and there size and specification pulley and there kinds	Pully boring according to shaft
13	Coupling there types and use, chain, chain sprockets, wire rope and clutch for power transmission system and there analysis	Coupling Boring and fitting
14	Gear specification of Gear, Types of Gear and there use key and there types and there use.	Key way cutting on shaft and pulley
15	Lubricant and coolest , Necessity of lubricant and coolest, types of lubricant and there use types of collect & there use different types of lubricating system	Preventing maintenance of machine
16	Bearing, Introduction, Necessity types of bearing its construction and there use according to work	Bearing fitting for any technical system
17	Gear Box, Different types of gear box and there uses Oil seal its use and there kinds gas kits	Gear Box overhauling
18	Welding types of welding its uses in Maintenance shop as a weared surface welding, Broken bolt remove by welding etc.	Weared shaft welding
19	Basic concept of effective machining, Requirement of good machining practice factors effecting the performance of machine tool ability of work piece	Spare gear cutting
20	Material to be machine cutting material and performance, tool life and factor affecting it tool failure problem of heat generation during machine power and stability of machine tools	Milling cutter sharpening

	economics of machining	
21	Jig, Fixtures templates roll of jig and fixture in mass production, types of jig and types of fixture factor to be considered for selecting and designing jig or fixture. Template and there use	Boring and bushing
22	A special machine tools, Turret lathe, capstan lathe, coping lathe its working and maintenance	Multi operation of turret lathe
23	Preventive maintenance and installation, New machine installation factor and preventive maintenance advantage there uses	Oil groove in bushes brg
24	Metal physical and mechanical properties of metal , Iron removing process from ORE, Ferrous Metal, Non Ferrous Metal, Ferrus and non ferrous allow its advantage	Helical gear cutting
25	Revision & Test	Project work
26	Examination	Practical Examination

Practical: - Basic Fitting, Turning & Machining

Topic	*Practical*
Basic Fitting, Turning & Machining.	Physical introduction to measuring instruments- Handling of Instruments- Exercise in the use of liner measuring instruments Such as steel rule of different ranges. Out side calipers, in side Calipers for measuring inside. Outside measurement, in side measurement, depth gauge.
	Measurement of flat rectangular objects, cylindrical objects. Hollow components, threaded components. Exercises on external & internal measurements using micrometers & Height gauges
	Introduction to safety including fire equipments & their uses. Familiarize with Fitter's hand tools. Filling a flat surface of mild steel & cast iron. Check for flatness straightness & square ness.
	Simple blue print reading. Mark out according to simple to simple blue print. Hack sawing to dimension. Filing flat & square to size to an accuracy of +0.1mm. Marking & punching of stepped & angular components & finishing of stepped & angular components & finishing the part to the required shape & size to an accuracy of +0.1mm.
	Exercise on angular measurement using combination set & vernier bevel protector. Center drilling, reaming, counter sinking, counter boring and tapping for various sizes of mild steel and tapping on various size of mild steel material.
	Fitting exercise-simple to complex (Involving drilling, tapping, reaming, counter boring & slide fitting).
	Introduction to the trade area & the type of jobs made by the trainees in the workshop. Safety on handling tools & equipment related to the trade. Setting up of arc & gas apparatus. Lighting & adjustment of oxyacetylene flame & fusion runs with & without filter rode on 2 to 3 mm thick M.S sheet(in flat position in gas) . Striking & maintaining of arc & drawing shot heads of M.S. plate 10 to 12 mm thick (in flat position in arc).
	Lap, fillet & fillet joints on MS sheet 3mm in flat position (gas). Oxyacetylene cutting hand & machine square & level on 12 mm MS plate. Brazing on MS & Copper.
	Manufacturing process and their importance in Industries. Safety precautions followed on shop floor Vernier caliper and micro-meter, construction, parts, principles, application making the jobs. Different types cutting tools, grinding practice on pedestal machine.
	Introduction of shaping, planning and slotting- construction, types, parts, function and used, shaping rectangular block as per sketch.
	Introduction to milling machine demonstration on working principle, setting of jobs, setting of cutter in arbor setting of vice on table. Step milling using side and face cutter checking with micro-meter. Slot Mill using slot milling cutter. Face mill using face milling cutter.
	Setting of indexing head on milling, table and mill a hexagon on a round bar using direct indexing method. Spur gear cutting on horizontal milling machine using simple indexing methods. Checking with gear tooth Vernier calipers. Milling a rack by linear indexing method
	Introduction of engine lathe and parts, holding the job in three & four jaw chuck. Facing and plain turning operations use of measuring tools required for

	turning.
	Facing, Plain and Turning. Taper Turning by compound rest slide methods. Setting threading tool and cutting the external "V" threads.
	Perform centre drilling, boring, parting off, Knurling, grooving, chamfering operations.
	Balancing and truing of grinding wheel. Mounting and dressing of grinding wheel. Re sharpen of plain turning tool on Pedestal grinder to an accuracy of one degree; check the tool angle using bevel protector.

LIST OF TOOLS AND EQUIPMENTS

Sr.	Particulars	Quantity
1	2	3
1	Measuring tape 3 meter	16
2	Inside spring caliper 200 mm	16
3	Outside spring caliper 200 mm	16
4	Ball pin Hammer - 200 gm	16
5	Fix spanner 23 mm set 9 spanner	16
6	Ring spanner 6 to 23 mm	16
7	Chisel cold flat 20x150 mm	16
8	Steal scale 300 mm engineering	16
9	Try square 200 mm	16
10	Screw driver 300 mm	16
11	Centre punch 100 mm x 100 mm	16
12	Scriber 150 mm	16
13	Bradawl 200 mm	16
14	Odd leg caliper spring type 200 mm	16
15	Out side spring caliper 400 mm	02
16	Inside spring caliper 400 mm	02
17	Ball pin hammer 400 gm	04
18	Flat chisel cold 25 x 200 mm	02
19	Cross cut chisel 150 mm	02
20	Sledge hammer 2 kg	01
21	Cross pin hammer 400 gm	02
22	Mallet	02
23	Teflon hammer	01
24	Vernier caliper 200 mm digital type	01
25	Vernier caliper 150 mm digital type	01
26	Micrometer 0-25 mm	01
27	Depth meter 0-300 mm	01
28	Slip gauge set	01
29	Feeler gauge leaf type 26 blades eng. & metric	02
30	Radius gauge leaf type 1to 15 mm	01
31	Digi matic thickness gauge	01
32	Universal Bevel protector	01
33	Pipe wrench 200 mm	02
34	Pipe wrench 300 mm	02
35	Adjustable wrench 250 mm	02
36	Combination pliers 200 mm	08
37	Long nose pliers 200 mm	04
38	Flat file bastard 250 mm	08
39	Flat file smooth 250 mm	08
40	Flat file rough cut 250 mm	04
41	Flat file rough cut 300 mm	08
42	Half round file smooth - 250 mm	04
43	Half round file rough - 250 mm	04

44	Round file smooth - 200 mm	04
45	Round file Smooth - 200 mm	04
46	Triangular file - 150 mm	04
47	Square file - 200 mm	04
48	Needle file set	04
49	Allen key 12,14,15,16,18,20,22 mm	02 each
50	Ring spanner 25x28, 24x26	02 each
51	Torque wrench	01
52	Tap set B S W	01
53	Die set B S W	01
54	Box spanner socket set 12.7 mm square drive hexagonal sockets set of size 10,11,12,13,14,15,16, 17,18,19, 21, 22,23,24,26,27,28,29,30,32,33,34 with accessories	02
55	Anvil big size	01
56	Surface plate 400x400 mm	01
57	'V' Block	02
58	Hack saw frame adjustable 300 mm	08
59	Grease gun	02
60	Oil cane 500 ml	02
61	Screw Driver 400 mm	02
62	Screw Driver 300 mm	02
63	Try square 300 mm	02
64	Tap set metric	01