

MINISTRY OF LABOUR & EMPLOYMENT
DIRECTORATE GENERAL OF EMPLOYMENT &
TRAINING OF
COURSE CURRICULA IN THE AREA / SECTOR OF
“ PROCESS PLANT MAINTENANCE ”
FOR UPGRADATION OF
ITI's into
CENTRE OF EXCELLENCE

Upgradation of ITIs into Centres of Excellence-Broad guidelines for implementation of Syllabi of Sector “ Processes Plant Maintenance ”

These Centres will be providing multiskill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below

- ✓ Training in Basic skill areas for a period of one year.
- ✓ Training in Advanced modules for next six months.
The testing & certification for the Basic skill training during first year & also for advanced training during next six months will be done under NCVT
- ✓ Training in specialized modules mainly in the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry. The trade testing & certification for this component will be done jointly by the State Government & Industry. Said certificate will be recognized by NCVT

As per the recommendations of the EFC, Training in the shop floor should constitute atleast 25-40% of the curriculum.

The training programme will have multi-entry and multi-exit provisions:

- ✓ trainee can opt to go to the labour market after completing broad based basic training of one year duration as well as after completing 1½ year of training.
- ✓ trainee can join advanced module as per his/her after some time .Specialized module would be offered after completing BBBT & at least one advanced module .
- ✓ ITI pass out trainee of the particular trade(s) from the conventional system can seek admission for advanced/specialized training in the relevant sector .

As per the approved curricula in the Area/Sector of **Processes Plant Maintenance** , uniform rotation of trainees in six modules each of eight weeks duration as mentioned below is envisaged to be taken up. The trades from where existing infrastructure i.e. equipment/ instructor etc. could be utilized for the training in ‘ **Processes Plant Maintenance** ’ and space requirement of each module is as under:

Table-1

Basic Module	NAME OF THE MODULE	Trade(s) from where existing infrastructure/equipment/instructor could be utilised	Minimum Space Requirement (sq.mtr.)
PPMBT-01	Basic Fitting	Fitter	115
PPMBT-02	Basic Turning & Machining	Turner/Machinist	115
PPMBT-03	Basic Refrigeration & Air Conditioning	Mech. Refrigeration & Air Conditioning	80
PPMBT-04	Basic Instrumentation	Mech. Instrument (General/ Chemical Plant)	96
PPMBT-05	Basic Electrician , Electronic & Computer	*Electrician / *Electronic Mech *COPA	80
PPMBT-06	Basic Laboratory Technician	Laboratory Assistant (Chemical Plant)	96

***facilities available in ITIs for trades viz Electrician/ Radio&TV/Electronic Mechanic /COPA may be utilized for imparting skill training of one to two weeks duration by adjusting the timings Where a**

particular trade/trades is/are not in operation , limited facilities required for imparting basic skill be created .

For each of above module, Trade Practical will be 28 hours /week and Trade theory for 4 hours /week. Apart from above, Generic modules as mentioned below will be taught throughout the year.

PPMBT -07 WORKSHOP CALCULATION & SCIENCE.....2 hrs/week
PPMBT -08-ENGINEERING DRAWING2 hrs/week
PPM G-01 -ENTERPRENEURSHIP AND COMMUNICATION SKILLS...2 hrs/week

In addition, 4 hours/week have been kept for Library studies & Physical Training

Vocational Instructors:

NAME OF THE MODULE	No. of Vocational Instructors (VIs)
PPMBT – 01 to 06	Six VIs one each for 6 module of relevant trades
PPMBT-07 & 08	One VI with relevant qualification as per need of module .
PPM G-01	One contract/part time / guest faculty for Generic module, ENTERPRENEURSHIP AND COMMUNICATION SKILLS –G-01

The eligibility and other criteria for admission will be as under :

Eligibility : 10th pass under 10+2 system with Science .

Batch size : 96 trainees 16 in each module (20% supernumeraries be allowed to take care of drop outs as already exist under CTS)

Admission:

For basic training, admissions are to be made in August / Feb each year.

Fee Structure:

Fee Structure may be decided by States Govt. in consultation with IMCs . It may be desirable to prescribe a uniform tuition fee for a sector in all Centres of Excellence of a state .

Space:

Since workshop/theory class rooms are envisaged to be accommodated in the existing building of the ITI, therefore norms prescribed in Table-1 are only for new infrastructure to be created .

- (1) Workshop space : As given in above table
- (2) Three Theory classrooms of 30 Sqm each .

The Theory classrooms should have latest infrastructure including AV aids as per details given below:

- 1. Suitable Chairs/ tables* -As required
- 2. OHP/Epidiastope - 1 No.
- 3. Laptop computer/PC (latest) & LCD projector** -1 No.
- 4. Magnetic white board -1 No.
- 5. White board -1 No.
- 6. Flip chart -1 No.

7. Storage Almirah

- As required

(* Optimum utilization of space/flexibility may be kept in view)

(**Keeping in view the constraints of funds under the scheme, it is proposed to procure only one set of Laptop computer/PC / LCD projector for CoE. However, States if so desire may procure additional Laptop computer/PC/LCD projector from their funds) While selecting furniture, it should be kept in mind that these are meant for Centres of Excellence. Criteria like maximum flexibility/utilization of space should be kept in view.

Office Equipment:

For each CoE one Scanner, one Photocopy Machine and one PC/printer along with suitable accessories/furniture and internet connection (if not already available in the institute) is proposed to be provided for each CoE, in addition to the equipment prescribed in the syllabus.

Addition/alteration/Construction:

For Civil Works, tentative amount of Rs 40.00 lakhs have been proposed per CoE. It is envisaged to have separate block/ wing for the Centres of Excellence in the ITI campus. In case space is available in the existing building of an ITI for taking up new areas as per requirement of the cluster of Industry, the existing space will be renovated as per the need. Alternately, separate block will be built up in the same campus keeping in view the space requirements of the Electrical Sector .

While planning for addition /alteration/Construction of workshop and Class rooms, following may be kept in view:

- ✓ concept of a Centre of Excellence
- ✓ the fact that the requirement of funds for construction /addition /alteration for advanced training will be higher than that of basic training

Publicity

Wide publicity & advertisement be given for better response . The role of the local as well as the concerned Industry is very vital for the success of this program.

States may consider providing additional equipment/ other facilities like separate Library/upgradation of existing Library, Conference Hall/ Committee Room etc. from their own funds.

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 UPGRADATION OF ITI's INTO CENTRE OF EXCELLENCE
 SECTOR: **PROCESS PLANT MAINTENANCE**
 BROAD BASED BASIC TRAINING (FIRST YEAR)

BASIC MODULE	NAME OF THE BASIC MODULE	DURATION IN WEEKS
PPMBT-01	BASIC FITTING	8 Weeks
PPMBT-02	BASIC TURNING & MACHINING	8 Weeks
PPMBT-03	BASIC REFRIGERATION & AIR CONDITIONING	8 Weeks
PPMBT-04	BASIC INSTRUMENTATION	8 Weeks
PPMBT-05	BASIC ELECTRICIAN, ELECTRONIC & COMPUTER	8 Weeks
PPMBT-06	BASIC LABORATORY TECHNIQUE	8 Weeks
	GENERIC MODULE	
PPMBT-07	BASIC ENGINEERING DRAWING	2Hrs/week
PPMBT-08	BASIC WORK SHOP CALCULATION & SCIENCE	2Hrs/ week
PPMG-01	ENTERPRENEURSHIP & COMMUNICATION SKILL	2Hrs/ week

**BOARD BASIC TRAINING
(FIRST YEAR)
BASIC MODULE – PPMBT-01: BASIC “FITTING”
DURATION-8 Weeks**

COURSE CONTENT

Week	PRACTICAL	THEORY
1	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.	Introduction to metrology objectives of metrology-measurement-Principles-methods of measurements. Terminology used in metrology- accuracy-repeatability-resolution etc. SI units of measurements - physical quantities under SI system.
2	Measurement of flat rectangular objects, cylindrical objects. Hollow components, threaded components. Exercises on external & internal measurements using micrometers & Height gauges	Selection of measuring instruments, care use & maintenance of measuring instruments-handing of precautions instruments-vernier caliper micrometer, high gauge, dial gauge (Plunger & bevel type) with stand (0.01mm resolution), checking square ness using combination set.
3	Introduction to safety including fire equipments & their uses. Familiarize with Fitter's hand tools. Filing a flat surface of mild steel & cast iron. Check for flatness straightness & square ness.	Manufacturing process in brief. Out line of various subjects to be covered. Introduction to hand tools & their safety. Environment factors& personal safety.
4	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.	Marking & punching tools. & their uses. Hacksaw-types, specification & their uses. Classification & specification of files, shapes, sizes and grades. Bench vice constructional details.
5	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.	Selection criteria of file. Vernier bevel protector-reading and use. Use of thread gauge and screw micro meter. Drilling machine-types-drilling operation –drill bits. Reamers-types care & maintenance.
6	Fitting exercise-simple to complex (Involving drilling, tapping, reaming, counter boring & slide fitting).	Taps & Dies-Description. Care & maintenance, Lubricants for tapping. Determination of drill size for tapping selection of spindle R.P.M.for drilling, tool holding and work holding and work holding device, types of fasteners. Standard size of size of threads. Taps application of adhesive metal. Shellac etc.
7	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).	Introduction to welding trade, importance of welding in industrial development. Subject to be taught & achievement of be made. Safety precautions in gas & electric welding, elementary knowledge of first aid. Description & uses of welding tools & equipments, Method of shaping & jointing of metals, riveting, bolting, brazing, soldering & welding.
8	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.	Basic methods of production of oxygen & acetylene on merical basis. Types of flame. Chemistry of neutral flame, principle of acetylene cutting, objects of using fluxes & rods.

LIST OF TOOLS & EQUIPMENT OF BASIC FITTING

Sr. No.	Particular	Required Qty.
1	Steel rule 30 cm graduated both in English & metric units	17
2	Out side spring caliper 150 mm	17
3	In side spring caliper 150mm	17
4	Hermaphrodite caliper 150mm	17
5	Divider spring 150mm	17
6	Centre punch 100mm	17
7	Hammer Ball pein 0.5 kg	17
8	Combination pliers 150mm	17
9	File flat bastard 300mm	17
10	File flat 11nd cut 250mm	17
11	Engineers screw driver	17
12	File flat smooth 200mm	17
13	Cold chisel flat 25x200mm	17
14	Granite surface plate 1000x 630 mm grade1	2
15	Metal stand table for surface plate 900x900x1200mm	2
16	Screw driver set (multi heads)	1
17	Scribing block universal 300mm	2
18	V block universal 300mm	2
19	Tri square 150mm	2
20	Out side spring caliper 200mm	2
21	Divider spring 200mm	2
22	Inside spring caliper 200mm	2
23	Straight edge steel 1mtr.	1
24	Straight edge steel 500mm	1
25	Steel tape 2 miters.	1
26	Sprit level	1
27	Hammer ball pein 800gms	3
28	Screw driver heavy duty 300mm	2
29	Hammer lead 1 kg	1
30	Combination set 300mm	2
31	Spindle blade screw driver 100mm	2
32	Dial gauge o/ 50mm	4
33	Lever type dial gauge o/50mm	2
34	Dial gauge stand	4
35	Screw pitch gauge set for metric pitches (0,5-7mm)	2
36	Radius gauge set metric 1-6mm	1
37	Allen hexagonal key set 2.5-12mm	2
38	Spanner double ended set (seven pcs.) in metric.	4
39	Adjustable spanner 300mm	2
40	Reduction sleeve MT as required	1
41	Angle plate size 200x100x200mm	2
42	Angle plat adjustable 250 x 150 x175mm	1
43	Solid parallels in metric	6
44	Oil can pressure feed 500m	3
45	Oil stone 150x50x25mm	2
46	Twist drills 3-13mm(paraller shank)	2
47	Drill chuck 0-20mm with taper shank	1
48	Centre drill A 1-5	2

49	Grinding wheel dresser (star type)	1
50	C clamps 100mm	2
51	C clamps 200mm	2
52	Tap & die set in box metric	1
53	Drill HSS taper shank 10-20mm	1
54	File flat 11nd cut 250mm	4
55	File flat smooth 200mm	4
56	File Half round 11nd cut 250mm	4
57	File triangular smooth 200mm	4
58	Needle file set	1
59	File square 11nd cut 250mm	4
60	Reamer set 6-13mm by 1mm	1
61	Hacksaw adjustable 300mm	8
62	Bench vice 150mm jaw	8
63	Magnifying glasses 75mm	2
64	Micrometer out side 0-25mm	4
65	Micrometer out side 25-50mm	2
66	Micrometer depth gauge 0-150mm	2
67	Direct reading vernier caliper 300mm	4
68	Vernier height gauge 250mm	1
69	Digital vernier caliper 200mm	1
70	Vernier bevel protector with least count of 5 minutes	1
71	Feeler gauge 0.1-1.0mm	1
72	Pillar type drilling machine 12mm cap with accessories	1
73	Radial drill machine 120mm Motorized with tapping attachment	1
74	Pillar type drill machine 20 mm caps. with accessories	1
75	Two wheel pedestal grinder 300mm	1
76	Hand drill machine 10mm capacity	1
77	Sledge hammer 10mm pound	1
78	Welding torch with tips assorted	2
79	Anvil	1
80	Mallet 1lb.	2
81	Number/alphabetic punch 100mm	1
82	Welding transformer 200A	1
83	Welding cable for above capacity in mt	50
84	Electrode holder	4
85	Chipping hammer	4
86	Screen helmet	4
87	Pressure Regulator Oxygen double stage	1
88	Leather gloves pair	4
89	Tongs holding 300mm	4
90	Pressure Regulator Acetylene double stage	1
91	Arc welding table	4
92	Lugs for cable	20
93	Rubber Hose pipe for Oxy. & Ace. in mt	50
94	Cutting torch Oxy-acetylene with tips	2
95	Spark lighter	6
96	Arc welding Generator set 350A	1
97	Gas Trolley	1
	FURNITURE:	
1	Instructor table 1200x760x760mm	1
2	Instructor chair with arm	1
3	Steel stools 300x300x450mm	16
4	Work bench 3000x1500x760mm	4
5	Discuss table 3000x1200x760mm	1
6	Steel locker with eight compartments	4
7	Steel almirah 1980x900x450mm	4

8	Book shelf 4 drawer	1
9	Steel rack 4shelf	3
10	Black board with stand	1
11	Fire extinguisher CO2	2
12	Fire bucket with stand	4
13	Artificial respiration chart	4
14	First aid box	1
	TOTAL	

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
BASIC MODULE- PPMBT-02 : BASIC “TURNING & MACHINING”
DURATION- 8 Weeks**

COURSE CONTENT

Week	Practical	Theory
1	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.	Outline of various subjects to be covered disciplinary rules of the Institute training and other facilities available. Importance of measurement. Types of precision measuring tools, Micro-meter and Vernier caliper, Principle, Construction of various parts, reading of micrometer and Vernier caliper both English and Metric system.
2	Introduction of shaping, planning and slotting-construction, types, parts, function and used, shaping rectangular block as per sketch.	Shaper, Planer and Slotting machine, construction types used of parts, General principle of power transmission. Various cutting tools and their angles and importance of angle.
3	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.	Milling machine – Introduction, construction, type's specification and application. Work holding devices and cutter holding devices. Process of milling Machine-up & down milling. Milling operation-plain milling. Stop milling. Face milling. Slot milling, angular and end milling etc. Classification of different type milling cutter and their used. Selection of cutting speed, feed and depth of cut for different milling operation.
4	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 indexing head types, parts, function and used. Indexing- types of indexing as direct, simple, differential, compound, angular and linear indexing and their calculation. Introduction of gear, types and their used. Spur gear elements and calculation.
5	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.	Manufacturing process in brief outline of various subjects to be covered. Disciplinary rules of the Institute. Training and other facilities available. Introduction to lathe description. Lathe-types of lathe machine, parts of centre lathe and function, lathe operation. Size and specification of a centre lathe. Lathe cutting tools- Types & tools, angle.
6	Facing, Plain and Turning. Taper Turning by compound rest slide methods. Setting threading tool and cutting the external “V” threads.	Work and tools, holding devices of lathe machine. Methods of mounting and dismounting chucks. Taper- types of Taper and their used. Taper turning methods and their calculation.
7	Perform centre drilling, boring, parting off, Knurling, grooving, chamfering operations.	Cutting speed, feed and depth of cut for different lathe operations, threads, types of thread and used. Cutting tool materials & types of coolants.

8	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.	Grinding machine- Introduction. Types specification and used. Grinding wheel, types and construction and mounting of wheel, wheel balancing & wheel turning. Metallurgy- types of metals, properties of metals, classification of steel, alloy steels and effect of alloying elements.
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LIST OF TOOLS & EQUIPMENT OF BASIC TURNING & MACHINING

Sr. No.	Particular	Required Qty.
1	Steel rule 30 both English & Metric Units	17
2	File Flat 2 nd Cut 250mm	17
3	Screw Driver 12"	17
4	Out side caliper spring type 150mm	17
5	Inside caliper spring type 150mm	17
6	Odd leg caliper spring type 150mm	17
7	Divider spring type 150mm	17
8	Centre Punch 100mm	17
9	Safety Glasses	17
10	Hammer Ball Pein 0.5Kg.	17
11	Combination Plier 150mm	17
12	File Flat bastard 300mm	17
13	File Flat Smooth 200mm	17
14	Plier cutting 200 mm	1
15	Centre Drill 2, 3&4	4
16	Vernier Height gauge 300mm	1
17	Surface plate 900x900x120mm with stand /table	1
18	Scribing Block Universal 300mm	2
19	"V" Block 100/7-80-A	2
20	Try Square 150 mm	2
21	Sprit level 2V 250, 05 Metric	1
22	Hammer B.P. 800 grams with handle	2
	Combination set 300 mm	1
24	Screw Driver Heavy Duty 300mm with handle	
25	Out side spring caliper 200mm	2
26	Inside spring caliper 200 mm	2
27	Straight edge steel 500mm	1
28	Steel Rule 60 cm graduate bottom English & Metric Units	2
29	Hammer lead 1 kg.	1
31	Surface Plate 400x400 mm	1
32	Hand Hack saw frame fixed 300mm	4
33	File square 2" Cut 250mm	4
34	Swivel Base Machine Vice 200mm	4
35	Bevel gauge 200mm	1
36	Telescopic Gauge 13 to 300mm	1
37	Assorted Carbide lathe tools with Holder different shapes & size	6
38	Hack saw frame adjustable 250-300mm	2
39	Micro Mater 50-75	1
40	Micro Meter depth gauge 0-200mm	1
41	Vernier Caliper 300mm (with all)	1
42	Vernier bevel protector with 150 mm blade	1
43	Micro Meter 0-25mm	2

44	Micro Meter 25-50mm	1
45	Dial Test Indicator with Magnetic gauge type .1grade A with magnetic base	1
46	Screw pitch Gauge for metric and English pitches	2
47	Milling cutters:	
A	Side & Face cutter 0 100x10x27mm	2
B	Side & face cutter 0 150x15x27mm	2
C	Side & face cutter 0 80x06x27 mm	2
D	Sell & Melt cutter 0 100x50x27 mm	2
E	Single angle cutter 63x18x45 0 RH	1
F	Double angle cutter 63x18x90 0x27 mm	1
48	Vernier Gear Tooth Caliper	1
49	Sine bar 200mm	1
50	Centre gauge 60 0 55 0	1
51	Slip Gauge set (normal set) Metric	1
52	Flange Micro-Meter 0-25mm	1
53	Limit Plug Gauge 5mm to 25mm by 2.5mm Range	1
54	Shaping machine 450 mm stroke (Motorized) with all attachments	2
55	Double Column planer 1500x100x1000 mm (Motorized) with all attachments	1
56	Slotter Machine 180mm Stroke (Motorized) with all attachments	1
57	Drilling Machine pillar 20mm capacity	1
58	Pedestal Grinding Machine Double ended with 300mm wheels (one fine and one rough)	1
59	Universal Milling Machine size No.1 with Standard accessories and the following attachments: Universal Indexing head with 03 indexing plat and set of changes gear 01 No. Long arbor 25 and 27 mm 01 each. Machine Vice swivel base 160mm-01 No	1
60	Milling Machine plain type Horizontal size No. 1 with standard accessories and the following attachments: Machine Vice swivel base 150mm- 01 No. Long arbor Dia 25 and 27 mm -01 No. Each	1
61	Spanner set D/E G.P. series 97 Pcs each)	2
62	Angle plate 200x100x200 mm	1
63	Milling machine Vertical size no. 1 with standard accessories and the following attachments: Collette adapter and Collette (standard size) – 01 set. Stab arbor style "C" Dia 22, 27 and 32 mm – 01 set. Rotary Table 300mm with indexing arrangements- 01 No.	1
64	Lathe General purpose all geared (gap bed) height of centre 150mm with 3 jaw and 4 jaw chuck, face plat, taper turning attachments, steadies etc.	4
65	Surface grinding Machine wheel Diaz 180mm reciprocating table, Longitudinal table traverse 200mm.. fitted with adjustment traverse stop, magnetic chuck 250mmx 120mm with set of grinding wheels ,diamond tools, holders for dressing &set of spanner etc.	2
	FURNITURE:	
1	Instructor table 1200x760x760mm	2
2	Instructor chair with arm	2
3	Steel stool 300x300x450mm	16
4	Discussion table 3000x1200x760mm	1
5	Tools cabinet	2
6	Steel almirah 1980x900x450	4
7	Steel lockers 8 compartments	4
8	Steel rack 4 shelves	3
9	Book shelf	1
10	Black board with stand	1
11	Fire extinguisher	2
12	Fire bucket with stand	4

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
BASIC MODULE- PPMBT-03: BASIC “REFRIGERATION & AIR
CONDITIONING”**

DURATION- 8 Weeks

COURSE CONTENT

Week	Practical	Theory
1	<ul style="list-style-type: none"> a- Use of refrigeration service tools, their care & safety. b- Cutting, bending And Joining of copper tubing, flaring, swaging, pinching & silver soldering. c- Identification of refrigeration system 	Refrigeration service tools, types, specification & use, Refrigeration components, type & use. Refrigeration principal & its application. Vapor compression system, components & division-H.P. & L.P. sides of system. Refrigeration capacity of system.
2	<ul style="list-style-type: none"> a- Dismantling of Commercial type reciprocating compressor, Checking components & parts. b- Cutting gasket of compressor. Testing efficiency of compressor. 	Refrigeration compressor- its function, mode of drive, type of compression classification. Reciprocating compressor name. Function, construction & parts.
3	<ul style="list-style-type: none"> a- Study & type of semi rotary, centrifugal & screw type compressor. b- Study, testing & servicing of air cooled condensers, evaporators, expansion valves & pressure switch. 	Semi rotary, centrifugal & screw type compressor their types, construction, application & function. Condensers, evaporators, expansion valves & pressure switch their types, construction, application & function. Automatic, thermostatic & capillary control. High pressure low pressure & oil failure switch their types, construction, application & function .
4	<ul style="list-style-type: none"> a- Handling of gas cylinders, transfer of refrigerant, gas charging, tests leakage in the system. b- Oil charging to compressor, installing compressor, cooling coil & condenser of refrigeration unit. 	Type of refrigerants, handling of refrigerants & cylinders. Colour code of cylinders, method of refrigerant transfer. Oil used in Refrigeration system, their properties, oil treatment & selection. Leak detectors, vacuum pump, gauge their type, specification, range of desirable vacuum in open & sealed system. Application of indirect refrigerants, Freon group refrigerants- their characteristics & properties.
5	<ul style="list-style-type: none"> a- Study types & checking of window, split type air conditioner & their fault finding. b- Study types & checking of water cooler, deep freezer, ice candy plant. 	Air conditioning & its principle, application. Window type, split type air conditioner their types, construction, application & function and trouble shooting. Water cooler, deep freezer, ice candy plant their types, construction, application & function and trouble shooting.
6	<ul style="list-style-type: none"> a- Study types & checking of air cooler, room cooler & desert cooler. <p>Study type & servicing of heat exchanger.</p>	Air cooler, room cooler & desert cooler their types, construction, application & function and trouble shooting. Heat exchanger their types, construction, application & function and trouble shooting.

7	<p>a- Study types & checking of cold storage, cooling tower, water softening & iron removing plants.</p> <p>b- Study types & servicing of fans, blowers, dampers, air filters and humidifiers.</p>	Cold storage, cooling tower, water softening & iron removing plants their types, construction, application & function and trouble shooting. Fans, blowers, dampers, air filters and humidifiers their types, construction, application & function and trouble shooting.
8	<p>Types, application & use of Gas welding, setting up of flames.</p> <p>Lighting & adjustment of oxyacetylene flame & fusion runs with & without filler rod on 2 to 3 mm thick M.S. sheet Lap & T Fillet joints on MS sheet 3 mm is flat position (gas). Brazing on MS & Copper.</p>	Gas welding process. Gas flame combination their flame temp. & application. System of oxy-acetylene welding brief description of gas cylinders, regulators & blow pipes. Chemistry of neutral flame, Principle of acetylene cutting, object of using fluxes & rods

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LIST OF TOOLS & EQUIPMENT OF BASIC REFRIGERATION & AIR CONDITIONING

Sr. No.	Particular	Required Qty.
1	Flaring tool set, single type for tube 4.7 to 16 mm OD	17
2	Swaging tool, punch type, set of size, for tube 4.7 to 16mm OD	17
3	Bending spring external type, for cu tube OD 6.4 to 16 MM	17
4	Pipe cutter miniature for cu tube 3 to 16 mm Dia	17
5	Pinch off tool for cu tube 6 to 18 mm	17
6	Pinch off Plier for cu tube 6 to 19 mm	17
7	Ratchet spanner 6.4 mm sq. reversible	17
8	Valve key T handle 4.7 & 6.4 mm sq.	8
9	Pressure gauge, Dia. 63mm with recalibration set screw, 0 to 35 kg/sq cm	2
10	Compound gauge, Dia. 63mm with recalibration set screw, pressure 15 kg/sq cm vacuum 76 mm	2
11	Gas leak detector for halogen gas electronic	17
12	Line tester 500v heavy duty	17
13	Punch hole for cutting gasket 4.7 to 16mm Dia	4
14	Scissor for gasket cutting 250 mm long	17
15	L-Allen key set 1.5 to 6.4 mm	2
16	T-Allen key set 5/32" & 1/8"	2
17	Screw driver plastic handle 6x150 mm	17
18	Screw driver plastic handle 10x250 mm	8
19	Insulated combination pliers 200 mm	17
20	Adjustable wrench 250mm	17
21	Engineers steel rule 300mm	17
22	Engineers try square 200mm	17
23	Chisel flat 25x150 mm	17
24	Divider spring joint 150 mm	17
25	Caliper out side spring joint 150 mm	17
26	Caliper in side spring joint 150 mm	17
27	Spanner set double ended 4.7to16mm	4
28	Ring spanner set 4.7 to 16 mm	4
29	Philip screw driver set	4
30	Oil cane Pressure type ½ lit.	4
31	Measuring tape 2m	4
32	Hammer ball pein 450gm with handle	17
33	Hammer plastic 300 gm	4
34	File flat double cut 200 mm	6
35	File half round double cut 200 mm	4

36	Caliper odd leg spring joint 150 mm	4
37	Centre punch 8x100 mm	17
38	Bench vice 100 mm jaw	8
39	Flaring tool set, double type for tube 4.7 to 16 mm OD.	1
40	Swaging tool, screw type with adaptor, set of size, for tube 4.7 to 16 mm OD	1
41	Pipe Bending tool set lever type with degree indicator for cu tube OD6.4 to 16MM01	1
42	Platform scale heavy duty 0 to 50 kg.	1
43	Refrigerant cylinder 30kg	2
44	Vacuum pump, two stage, self contained With motor, portable, final vac. 0.1 micron with gas ballistic valve, splash reducing non return valve cap 1/2 HP	1
45	Charging cylinder SS portable cc & mm scale compensation for vol. fluctuation	1
46	Charging manifold with valves & gauges	1
47	Dial thermometer remote control dial- 75MM, - 55 c to + 50 c	1
48	Electronic leak detector tangesterised With visible and audible indicator	1
49	Vacuum thermocouple gauge 1-3000mic	1
50	Stop watch	1
51	Filler gauge 0.05 to 1.0mm	1
52	Instrument screw driver set	1
53	Flexible box spanner set 6.4 to 10 mm	1
54	Socket set reversible ratchet ½ sq. drive with extension 4.7 to 31.3 mm	1
55	Torque wrench 300mm 12.7sq. drive	1
56	Blow lamp cap. 1 lit.	2
57	Puller 3 leg with flexible arm 120mm	1
58	Puller 2 leg with flexible arm 300 mm	1
59	Spirit level metallic 200 mm	1
60	Snipper sheet metal straight nose 200mm	2
61	File square double cut 150mm	2
62	V block with clamp 75 mm	2
63	Micrometer out side 0 to 25 mm	1
64	Vernier height gauge 250 mm	1
65	Tap set with matching drills 3 to 16 mm	1
66	Tap set with matching drills ¼ " to 5/8 " mm	1
67	Stock & die set 3 to 16 mm	1
68	Gas Cylinder trolley two wheel type	1
69	Pedestal grinder double ended wheel Dia 200mm & 3000rpm.	1
70	Air compressor two stage for oil less dry air with rust proof tank assembly, heater & controls max pr. 10kg/cm2 cap 45 lit 1Hpmotor	1
71	Refrigerator compression type 165 lit	1
72	No frost refrigerator compression type 165 lit	1
73	Deep freezer 165lit,-180C, ¼ HP	1
74	Water Cooler storage type	1
75	Air cooler 16" fan size ss body	1
76	Desert cooler 20" fan size	1
77	Window air conditioner cap-3000k cal/hr	1
78	Split air conditioner cap-2000k cal/hr	1
79	Fire extinguisher	2
80	Fire bucket on stand	4
81	Respiration chart	1
82	Reciprocating compressor with provision of capacity control etc for demonstration	1
83	Cold storage plant complete with all controls & accessory including cooling tower & water treatment plant cap 15000k cal/hr	1
84	Ice candy unit complete with ss tank, mould Box, thermo Cole insulated sun mica body.Agitator compressor, motor pipe fitting etc.3000k cal/hr	1
85	Air conditioning plant, direct & indirect, water Chiller complete with all controls including Humidity control etc. cap 15000k cal/h	1
86	Working model of vapor absorption system Or refrigeration cap 1500k cal/hr	1

87	Condenser, evaporator, receiver, metering device & hose pipe etc	1Set
WORK SHOP FURNITURE		
1	Instructor table	1
2	Instructor chair with arm	1
3	Steel stool 300x300x450 mm	16
4	Desk	16
5	Steel almirah	5
6	Steel locker	3
7	Steel rack 4shelf	3
8	Black board with stand	1
9	Work bench 1800x1200x760mm	3
10	Book shelf 3 drawer	1
SPARE PARTS / ACCESSORIES		
1	RELAYS	4
2	Capacitors	4
3	Over load protectors	4
4	Selector switch	4
5	Thermostatic switch	4
6	Flare fitting	2
7	Expansion valve-thermostatic/automatic	6
8	Solenoid valve	2
9	High pressure/ low pressure cut out	2
10	Oil failure switch	2
11	Liquid indicator	2
Gas welding equipments		
1	Goggle pair welder type	16
2	Spark lighter	16
3	Pressure regulator oxygen double stage	5
4	Pressure regulator oxygen double stage	5
5	Out fit spanner	6
6	Rubber hose clip	50
7	Spindle key for opening	6
8	Trolley for cylinder	2
9	Welding torch tips assorted for alive set	5se
10	Cutting torch oxy acetylene with cutting & gauging tips	2se
11	Gas welding tables 1200x920x600 mm Fire bricks on stand with petitioners	5
12	Tip cleaner	8
13	Rubber hose pipe black & red 8mm (each)	3 mt each
14	Oxygen cylinder empty	1
15	Acetylene cylinder empty	1
16	Hack saw frame 300 mm	2
17	Chisel cold flat 25x125mm	16
18	Tongs holding 300 mm	6

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
BASIC MODULE – PPMBT-04: BASIC “INSTRUMENTATION”
DURATION- 8 Weeks**

COURSE CONTENT

Week	PRACTICAL	THEORY
1	Electrical measurement & measuring instruments : Testing and calibration of ammeters & volt meters of various types & construction of M. C. & M. I. Measurement of power by watt meter & calibration of watt meter, KWH meter.	Principle of M. C. & M. I. meters, measurement value, shunt constructions & connection, voltage measurements, instrument sensitivity, meter accuracy, changing meter range. Using of AC/ DC meters.
2	Industrial Electronics: Identification of various types of diodes, LED' S & Seven segment displays. Hooking up a voltage regulators and determine its characteristics. Use of differential amplifier, operational amplifier. Identification of different of different types of oscillators.	Introduction to special semiconductors diodes & characteristics. Introduction & purpose shunt regulators, series regulators, I.C's regulators & switching regulators study of operational integrator. Study of invertors & converters & special operational circuits. Study of different types of oscillators-crystal, phase shift Armstrong, colpitt's, clap, Hartley & I. C. oscillators.
3	Basic logic circuits & Microprocessor: Verification of gates, flip-flops etc. study of logic circuits of all types. Perform practical on trainer's kit or trainer. Identification of signal and control cables, screen cables shield. Practical on microprocessor training kit.	Study of Basic logic circuits, digital I.C's, digital logic, Logic, gates-AND, OR, NOT, NAND, NOR, EX –OR, EX-NOR & Binary coded decimal. Study of different types of cables. Introduction to microprocessor & computer, purpose & use & physical properties.
4	Fundamental of measuring instruments & systems: Practical on Instrumentation trainer/ simulator, computerized instrumentation simulator. Principle of transducer operation	The purpose of process measurement, use of measurement, display & error in measurements & study of different types of measuring instruments. Remote vs. local display. Errors in measurement systems, calibration, noise response time.
5	Speed, R.P.M.& Pressure measurements: Overhauling and testing of speedometer and tachometer. Identification with different types of pressure measurements by meters, gauges, sensors. Repairing, fault finding, testing & calibration with dead weight tester & manometers.	Description, working principle & study speedometer & tachometer. Principle of different types of pressures, liquid pressure, gauge pressure & gas pressure etc. & its meters. Pressure sensors, pressure transducers & instrument.
6	Temperature & flow measurement: Various types of flow meters, maintenance of orifice, venture, flow nozzle & its use. Dismantling, overhauling & calibration of DP cell/ transmitters. Fitting of tapered glass tube Rota meter checking & testing. Performing practical on temperature measurement with different sensors in temp. Controlled oil bath. Practical on various thermocouples, RTDs & pyrometer. Temperature measuring instrument maintenance & calibration.	Basic properties of fluids, its motion, flow & rate, Reynolds number. Flow measuring devices, study of Rota meter. Temperature, types of heats, various temp. Scales. Bimetallic, fluid filled & electrical temperature instrument (bulbs, capillary, Bourdon tubes, temp. transmitters, and RTD bridge circuits). Pyrometer.
7	Recorders & controllers: Overhauling, checking, fault finding, repairing & testing of pneumatic, electrical & electronic round & strip chart recorders (single & multi points). PID controllers. Maintenance of various control valves.	Construction, principle, installation & maintenance & types of ink, chart, chart mounting & driving technique. Analog, digital controllers, control ranges & limit, timers & counters, data manipulation.

8	Basic Hydraulics and Pneumatics: Practical on Hydraulic trainer. Pneumatics systems, force weight & pressures. Practical on pneumatic training kits.	Principle of hydraulics – Fluid power and hydraulics, force, weight & mass pressure, work, power m energy etc. Principle of Pneumatics – Mass pressure , work & energy etc.
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LIST OF TOOLS & EQUIPMENT OF BASIC INSTRUMENTATION

Sr. No.	Particular	Required Qty.
1	2	3
1	Steel rule 150 mm	17
2	Screw Driver watch maker set of 6Pcs.	17
3	Tool kit boxes	17
4	Screw Driver electrician 150mm	17
5	Combination Plier 150mm	17
6	Flat Nose Plier 100mm	17
7	Hammer ball pein 1/41b	17
8	File flat lInd cut 250mm	17
9	File half round smooth 250mm	17
10	Allen key set of 10pcs. In mm	17
11	Screw driver set of 6pcs.	17
12	Neon tester 500volt	17
13	Hammer cross pein 1lb	4
14	Triangular file 100mm	4
15	Allen key set of 10pcs. In inch	4
16	Spanner adjustable 100mm	2
17	Hammer cross pein 1lb	4
18	Triangular file 10mm	4
19	Hand drill machine 6mm capacity	2
20	Tri square 100mm	2
21	Hack saw frame 300mm	4
22	V block with clamps 50mm	1
23	Eye glass 75mm focus watch maker	2
24	Surface plate 300x300mm	1
25	Oil cans ½ lit.	2
26	Sprit level metal 100mm	2
27	Electric soldering iron 125 watt	2
28	Vernier caliper 300mm	1
29	Electric soldering iron 10 watt	4
30	Micro meter out side 0-25mm	1
31	Screw driver heavy duty 200mm	4
32	File flat bastared 300mm	4
33	File flat smooth 1500mm	4
34	Tap set metric 5,6,8, 10mm set of 3	1"
35	File Tri angular lInd cut 150mm	
36	File half round lInd cut 200mm	4
37	File feather edge smooth 100mm	2
38	Bench vice 100mm jaw	8
39	Tap set BSW 3/8", ½ set of 3	1each
40	Pipe vice 100mm jaw	1
41	Spanner double ended metric set10	2set
42	Reamers parallel 1/16" to ¼ " set of 7	1set
43	Centre punch 10x100mm	2set
44	Hammer ball pein 1.5 lb	4
45	Letter punch 10x100mm	1set
46	Twist drill SS 1/16 " to ½"	1set
47	Twist drill SS 2 to 12mm	1set

48	Blow lamp 1ltr capacity	2
49	Chisel cold flat 25x150mm	2
50	Sine bar 125mm with plate	1
51	Flaring tool kit up to 20mm	2
52	Combination set 300mm	1
53	Ring Spanner double end metric set10	2sets
54	Feeler gauge leaf type 0.0015"-0.025"	2
55	Dial test indicator in mm	1
56	Radius gauge leaf type 1-15mm	2
57	Standard wire gauge	2
58	Fire extinguisher soda acid /foam	2
59	Fire buckets	4
60	Instructor table 1200x760x760mm	1
61	Instructor chair with arm	1
62	Steel almirah 1980x900x450mm	6
63	Steel stool 300x300x450mm	16
64	Steel locker 1980x900x450mm 8 hole	3
65	Black board with stand	1
66	White magnetic board with complete Accessories	1
67	Work bench 1800x900x760mm	4
Electrical Instruments		
1	Watt-hour meter 2kw mechanical type	1
2	Watt-hour meter2, 5kw electronic type	1each
3	Ohm meter 100ohms	1
4	Multi-meter Analog type	2
5	Multi meter digital type 4.5 digit	20
6	Insulation tester 500volt	1
7	Ampere hour meter 10A	1
8	Calibration for testing AS/DC ammeters & Volt meters	1
9	Tester for testing Watt hour meter	1
10	Ammeter 0-1A DC moving iron type	2
11	Ammeter 0-3A DC moving coil type	2
12	Ammeter 0-10 A AC/DC MI type	2
13	Ammeter 0-30 AC/ DC MC type	2
14	Voltmeter 0-5V AC/DC MC type	2
15	Voltmeter 0-50V AC/ DC MC type	2
16	Voltmeter 0-250V AC/ DC MI type	2
17	Voltmeter 0-5mV AC/ DC	2
18	Rheostat 25ohms, 500ohms	2each
Flow Instruments		
1	Deflecting vane flow meter	2
2	Rotating vane flow meter	2
3	Helical & turbine flow meter	1each
4	Pitote tube flow meter	1
5	Venturi tube flow meter	1
6	Orifice type flow meter	1
7	Tapered tube flow meter	1
Level Instruments		
1	Hook type level indicator	1
2	Sight glass level indicator	1
3	Float type level indicator	1
4	Static pressure level indicator	1
Optical Instruments		
1	Microscope low power	1
2	Theodolites	1
3	Binocular	1

4	Telescope	1
	Temperature Instruments	
1	Mercury in glass thermometer	4
2	Alcohol in glass thermometer	4
3	Resistance bulb wheat stone bridge type thermometer	2
4	Thermocouple type pyro meter with Milli- volt meter with different thermocouple	2
5	Optical pyrometer	1
	Pressure Instruments	
1	U tube mano meter	2
2	Inclined limb mano meter	1
3	Bourdon tube pressure gauge	8
4	Pressure regulator gas	2
5	Capsule type pressure gauge	1
	Flow meters	
1	Simple tank type quantity meter	1
2	Reciprocating piston type flow meter	2
3	Impeller type flow meter	2
	Recorders & Controllers	
1	Circular chart type recorders	2
2	Strip charts type recorders	2
3	Secondary devices for measurements Of temperature, pressure, level & flow for above recorders	2 each
4	OFF-ON type controller	1
5	Proportional type electronic controller	2
6	Pneumatic controller for pressure Temperature& flow with accessories	01each
7	Pneumatic, Hydraulic & Electronic transmitter for above controller & recorder	01each
8	Pneumatic trainer kit-consisting of cylinders, different types of direction control valves, pressure dependent valves, flow control valves with accessory	2
9	Hydraulic trainer kit with power packed consisting of cylinders, different types of direction control valves flow control valves with accessories.	2
10	Experimental setup for pressure measurement consisting of air Compressor, pressure vessels, pressure transmitter, controller, recorder & final control element i.e. pressure instrumentation trainer.	1
11	Pressure transmitter electronic	1
12	Pressure transmitter pneumatic	1
13	Temperature transmitter electronic	1
14	Electric, pneumatic & hydraulic actuators	01each
15	Electronic pressure calibrator	1
16	Electronic temperature calibrator	1

**BROAD BASED TRAINING
(FIRST YEAR)**

**BASIC MODULE – PPMBT-05: BASIC ELECTRICAL & ELECTRONICS AND COMPUTER
(DURATION – 8 WEEKS)**

COURSE CONTENT

(A) ELECTRICAL & ELECTRONICS - 4WEEKS

(B) COMPUTER SKILLS- 4 WEEKS

Week	PRACTICAL	THEORY
1	Demonstration of use of safety equipments and artificial respiration. Use of hand tools, join practice with single and multi – stand conductors of different wires. Joining practice of bare conductors – soldering practice on printed circuit boards- Demonstration & practice on soldering the aluminum conductor, cable joints. Use of aluminum flux and Alca ‘p’ solder. Demonstration and practice of crimping of various wires.	Importance of safety – Description, specification, general care & maintenance of common hand tools, wires & cable – conductors, insulators & semiconductors- their shapes, sizes with respect to low, medium & high voltage. Soldering printed circuit boards & its uses- different fluxes for different purpose on metal's- crimping equipment- joining of conductors by soldering. Importance of preventive maintenance and routine tests Earthing and its importance
2	Making of a simple circuit with a lamp and battery. Study and use of multi meters - measurement of current, voltage, resistance in DC\AC circuits. Demonstration & verification of ohm's law – series circuits – parallel circuits. Demonstration in circuits –use of tong tester and megger .	Resistance, voltage, current, open circuit and short circuits-ohm's law- voltage drop – series & parallel circuits-power & energy relations – electrical measuring instruments-millimeters common electrical accessories used in industries- bus-bars, replays, contactors, circuit breakers, etc.. Fuses and its rating – materials used.
3	Simple wiring practice with distribution boards, junction boxes, main switches two way and intermediate switches. Identification of different parts of dc generators-testing and measuring the field and armature resistances. Identification of different parts of ac motors-testing and measurement on induction motors- demonstration on alternators. Identification and testing of transformers. Grouping & testing of cells for a specified voltage & current-preparation of battery charging.	Induction principals – electro-magnetism – faraday's laws single phase & poly phase system 3 phase star-delta connections, impedance & power factors-principals & application of DC motors, series, shunt & compound motor-AC motors, transformers & its applications. Chemical effect of electric current – rechargeable batteries –care & maintenance of cells. AC motors starting with DOL starter & star-delta starter.
4	Identification of different type of capacitors- testing of capacitors – identification and testing of assorted diodes, PNP\ NPN transistors – uni-junction transistor, field effect Transistor & silicon controlled rectifier lcs etc. - demonstration on rectifiers – identification of lcs.	Static electricity-capacities and its applications. Fundamental of a electron theory- semiconductor devices-symbols-specification-diodes-transistor, uni junction transistor. Field effect transistor, silicon controlled rectifier & lcs. Half wave, full wave & bridge rectifier with filters, DC power supply.
5	Booting the computer ,opening windows menus, using the mouse, refresh computer desktop using right click of the mouse, create a directory in Expand Linux, format a floppy , create a file using notepad, save the file in floppy, copy the file into hard disk, copy a file from hard disk to floppy, create a directory in floppy, create a directory in hard disk, use my documents , use start menu for opening an application , to open a document recently written, change control panel settings for familiarize with keyboard and keys.	Introduction to computer fundamentals and its parts, familiarization with disk drives, booting of a computer system, using the windows XP, Linux, menu system, tool bars, file structures, directories, moving and copying a file from floppy to hard disk, hard disk to floppy disk, creating directories. Formatting floppy disk.
6	Techniques of changing desktop wall paper, changing desktop screen properties, control	Use of desktop, control panel settings, explorer, regional settings shortcuts, use of simple

	<p>panel, user accounts, customizing icon, writing a sample text using notepad, using paint for drawing figures to get accustomed with mouse. Saving a file. Using windows explorer ,install a software , remove a software, add new changing the regional settings of the system (like a printer , change the system date and time, changing the regional setting of the system like country, currency, date format, using start menu, creating desktop short cuts</p>	<p>applications like paint, notepad.</p>
7	<p>Open internet explorer, change the settings in IE, customize internet explorer for default applications, enable cookies, change the security settings, setup an internet connection, user ID and password saving in the computer for future usage, setup outlook express for an Email account, setup server authentication settings, receive and send Email from the account. Search using yahoo and Google for certain topics, download file. Setup the net meting using MSN and yahoo messenger.</p>	<p>Study of internet explorer, modem, setting in the IE & modem , dialup and broad band connection, outlook express, viewing Email accounts, using search engine, video conferencing , MS chat.</p>
8	<p>Open MS WORD, create a new file, save a file, open an existing file, save as a text file, type a paragraph, set for left and right margins, change the letters from upper to lower case vice versa, cut a paragraph, copy a paragraph, setup tab positions, draw a simple table, insert rows, insert columns, erase rows, erase columns, search the document for spelling corrections, print the letters in a printer attached in portrait and landscape. Open excel and workout the following to understand the theory commands. Prepare a salary bill for ABC organization with column A for names, column B for basic salary, column C for DA, column D for addition of B & C to get the full salary, add the column D into a new cell as TOTAL amount. Print the sheet using set print areas with margins, and use scale factor for reduction and enlargement, use portrait and landscape.</p>	<p>Creating sample documents using MSWORD. Text wrapping, text formatting. Changing letters to different case, drawing table, mail merging, and page formatting, using different font type, and printing a document using excel as spread sheet, familiar with cells, formulae, text, numbers and date, using shortcuts for entering date and numbers in progressive cells, copying formulae, text and numbers, using boarders, merging cells, unmerging, changing cell width, row height, printing an area of the sheet, options of printing like fit to paper, shrinking etc. using different sheets in a work book, changing colour of cells, fonts, text.</p>

LIST OF TOOLS & EQUIPMENT OF BASIC ELECTRICAL, ELECTRONIC & COMPUTER

Sr. No.	Particular	Required Qty.
1	2	3
1	Combination plier 200mm insulated	16
2	Screw driver 100,200mm	16
3	Screw driver 200 mm	16
4	Neon tester 500volt pencil bit type	16
5	Electrician knife	16
6	Hammer ball pein 0.25kg	16
7	Plier side cutting 200mm	16
8	File round 150mm	16
9	Electric soldering iron 10watt	16
10	Plier round nose 200mm	16
11	Analog multimeter 0.5,100,200 500mA 0-100-1000,10000OHM'S 0-150,300,600 v ac\dc.	16
12	Plier flat nose 150mm	4
13	Crimping tools	1
14	Plier flat nose 200mm	4
15	Firmer chisel 25mm	4
16	Tweezers	16
17	Hammer ball pein 1kg	1
18	Wall jumper octagonal 37mmx450mm	1
19	Centre punch 100mm	1
20	Steel measuring tape 20 meters	1
21	Allen key set	1
22	Spanner double ended set of 6	2
23	Adjustable spanner 250mm	1
24	Steel rule 300mm	4
25	Electric soldering iron 35 watt	4
26	Electric soldering iron 125 watt	2
27	Auto transformer variac 230v	1
28	Rubber gloves pair 500volt	2
29	Bench vice 100mm jaw	2
30	Portable type grinder 150mm wheel	1
31	Bar magnet	1
32	Horse shoe magnet	1
33	Electric drill machine 6mm capacity universal type 250v	1
34	Dc shunt motor 1hp250v(laboratory type)	2
35	Universal motor 750 watt AC\DC 250v	2
36	Squirrel cage induction motor 1hp 230v with D.O.L. starter	1
37	Transformer single phase 500mA\250\12V	4
38	L.F. oscilloscope	
39	Star-delta starter (contact type 8 points)	1
40	Tong tester	1
41	Megger	1
42	DC power supply 0V-110V\5A	1
43	I.C.tester digital type	1
44	I.C.tester analog type	1
45	Hack saw frame 300mm	2
46	Rubber mat 3000x1500x12mm	4
47	Tool kit	5
48	Trainees locker	2
49	Vacuum cleaner	2
50	Soldering iron 10watt	17
51	Photostat machine	1

52	Centralis88 UPS with 5KVA capacity	1
53	Laser printer	1
54	Dot matrix printer	1
55	Windows XP or 2003 operating system	9
56	Ms-office 2003	9
57	Push button telephone	9
58	Cordless telephone	9
59	Fax machine	2
60	Telephone line connectively	
61	Pentium IV computer or latest with 512MB RAM with the following accessories: DVD combo with the latest X version, hard disk with 80GB or above, 17" monitor colour, AGP graphics card with 64MB, 10/100 Ethernet card, modem	9
	Furniture	
1	Instructor chair with arm	1
2	Instructor table 1200x760x760mm	1
3	Steel stool 300x300x450mm	16
4	Discussion table 3000x1200x760mm	1
5	Work bench 3000x1200x760mm	4
6	Steel almirah 1980x900x450mm	6
7	Steel locker 8 compartments	4
8	Steel rack four shelves	4
9	Book shelf	2
10	Black board with stand	1
11	Suitable computer tables	9
12	Computer chairs	17
13	Printer tables	2
14	Photo state machine trolley	1
15	White magnetic board with accessories	1

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
BASIC MODULE – PPMBT-06: BASIC “LABORATORY
TECHNIQUES”
DURATION – 8 Weeks**

COURSE CONTENT

Week	Practical	Theory
1	A-Safety precaution to be used in laboratory. B-Volumetric analysis- types of titration. Analysis of acids bases & salts.	Introduction to chemistry. Elements, atoms, molecule. Laws of chemical combination, chemical equilibrium, atomic, molecular & equivalent Weights, periodic table of elements. Study of different types of lab apparatus. Volumetric analysis
2	A-Young's modulus, law of parallelogram, thermal conductivity of metals. B-Faraday's laws of electricity. Study of electric cells-series & parallel connections.	Periodic study of group elements. Metallurgy of- copper, iron, zinc, tin, lead, cobalt, nickel & chromium.
3	A-Organic preparations- etherification, supranational, nitration, oxidation, reduction, hydrolysis & saponification. B-inorganic preparation- alum, Mohr's salt, copper sulphate, potassium nitrate.	Preparation, properties & uses- hydrogen, oxygen, sulphur, nitrogen, phosphorus & its compounds. Preparation, properties & uses- chlorine, bromine, iodine, fluorine & its compounds.
4	a-Oil analysis- acid value, saponification value, estimation of sugar by Lane's method, glucose by iodometry, fat by Soxhlet's method. B-Analysis of organic compound-elements present, group location.	Preparation, properties & uses-H ₂ O ₂ , HCL, NH ₃ , Ozone, HNO ₃ , NaOH, H ₂ SO ₄ , KMnO ₄ .
5	A-Microbiology-study of staining, size if micro organism, total plate count. B-Types of distillation for liquid. Purification of substances using different techniques, sublimation error.	Preparation, properties & uses- bleaching powder, aluminum chloride. Introduction to micro biology- bacteria cell, nutrition of bacteria, rate of multiplication, sterilization. Distillation & its type & importance.
6	A-Determination of melting, boiling, flash, pour & freezing points of liquids. B-Alloy analysis-bauxite, brass.	Preparation, properties & uses- lime stone, cement, soda ash, sodium carbonate, sand, glass, alums & alloys.
7	A-Gravimetric analysis, inorganic qualitative analysis. b- Raw, DM/ DI, distilled, boiler & cooling water analysis.	Study & types of water of Industries.
8	Principle, handing & procedure to use following laboratory equipments-balances, viscometer, surface tension apparatus, pH meter, turbidity meter, conductivity meter, microscope, refractrometer, hydrometer, thermometer, alcohol meter, Pykno meter, electrolytic analyzer, polar graph. Orsat apparatus, IR moisture balance, specific job analyzer.	Study & use of laboratory equipments.

LIST OF TOOLS & EQUIPMENT OF BASIC LABORATORY TECHNIQUE

Sr. No.	Particular	Required Qty.
1	2	3
1	Analytical balances with rider, optical, one pan Analytical balances	4
2	Semi analytical balances	2
3	Balance 1 kg	1
4	Auto-clave electrically heated	1
5	Centrifuge electricity	1
6	Vacuum pump	1
7	Electric dry oven 200 ^o c	1
8	Furnace 1100 ^o c.	1
9	Water bath electrically heated	2
10	Microscopes	3
11	Microscopes metallurgical	1
12	Polarimeter	1
13	Refracto meter	1
14	pH meter	1
15	Conductivity meter	2
16	Viscometer	2
17	Apparatus for distillation	4
18	Orsat apparatus	4
19	Surface tension apparatus	1
20	Turbidity meter	1
21	Pykno meter	1
22	Hydrometer	2
23	Electrolytic analyzer	1
24	IR moisture balance	2
25	Refrigerator 320 lit	1
26	Stirrers with mortars 230v, cap.-7 lit	4
27	Magnetic stirrer 2 lit	1
28	Mortar 150mm steel	1
29	Electric heating plate	1
30	Scissors	2
31	Melting point apparatus	1
32	Flash point apparatus	1
33	Bunsen burner	20
34	Glass blower lamps for gas, oxygen & tools	5
35	Rubber tube in meter	25
36	Tongs	20
37	Test tube	50
38	Tripods	20
39	Asbestos wire gauge	20
40	Cork rings	20
41	Test tube holders	20
42	Clamp holder	20
43	Clamps	40
44	Rings with clamps for filtering & heating	40
45	Stands	25
46	Stands with clamps for burettes	25
47	Triangle clay	28
48	Apparatus for deminearlisng water	25
49	Apparatus for deminearlisng water	1
50	Erlenmeyer flasks 250ml	40
51	Burettes 25ml	20

52	Burettes 100ml	20
53	Burettes micro 5 ml	10
54	Burettes automatic 25 ml	5
55	Crucible nickel Ø 30mm, ht-40mm, rabbles brushes liquid soap, acid cleaning mixture for glass ware, glass wool.	2
56	Pipettes 10ml	20
57	Pipettes 25ml	20
58	Pipettes measuring 0-10ml	2
59	Pipettes measuring 0-1ml	2
60	Pipettes automatic 10ml	2
61	Flask 500ml	2
62	Measuring cylinder 25ml	10
63	Measuring cylinder 100ml	20
64	Measuring cylinder 500ml	20
65	Weighing bottle 100ml	20
66	Funnels Ø 100ml	20
67	Funnels separatory 50ml	10
68	Volumetric flask 100ml	10
69	Volumetric flask 1000ml	10
70	Funnels separatory 250ml	10
71	Funnels for filter crucible & gooch crucible with rubber rings	20
72	Beakers 250ml	40
73	Beaker 600ml	20
74	Beaker 1000ml	10
75	Watch glasses Ø 7.5cm	20
76	Watch glasses Ø 15cm	40
77	Dishes evaporating Ø 7.5cm	15
78	Dishes evaporation Ø 15cm	10
79	Thermometers 0-110c	20
80	Thermometers 0-250c	10
81	Thermometers 0- 350c	10
82	Filtering 0,1,2,3 glass	2
83	Boiling flasks with round bottom 50ml	20
84	Filtering flasks 250ml	20
85	Filtering flasks 1000ml	4
86	Flasks soxleth with condensers	10
87	Vacuum flasks 250ml	5
88	Vacuum 1000ml	4
89	Condensers lie big 30mm long	10
90	Condensers lie big 50cm long	5
91	Condensers bulb type 30cm long	4
92	Condensers spiral type 20 cm long	3
93	Ventiles for volumetric analysis KCl 03	15
94	CO ₂ determination apparatus (schrotter)	2
95	Gas generator (kipp)500ml	2
96	Gas washing bottles (Dresher)	20
97	Drying tubes with one bulb	5
98	Crucibles porcelain cm, height 4cm indigenous.	40
99	Test tube (160mmx15mm)	500
100	Test tube 10mm	400
101	Water pumps for vacuum	4
102	Distillation columns 20-30 cm long	8
103	Gas sampling tubes	20
104	Tubes for centrifuge	500
105	Tube for Gerber centrifuge	25
106	Bottles with droppers for indicators for solutions & semi micro qualitative analysis 30ml	80
107	-do-50ml	40

108	Bottles for solids 50ml	30
109	Bottles for solids 100ml	20
110	Bottles for solutions 250ml	30
111	Bottles for solutions 100ml	40
112	Bottles for solution 1000ml	10
113	Bottles solution 2000ml	10
114	Bottles for solutions 5000ml	10
115	Two can analytical balance with rider.	03
116	One pan analytical balances (meter type)- if available indigenously 0.1 mg sensibility	02
	FURNITURE	
1	Instructor table 1200x760mm	01
2	Instructor chair with arm	01
3	Steel stool 300x300x450mm	16
4	Discussion table 3000x1200x760mm	02
5	Steel almirah 1980x900x450mm	06
6	Steel rack 6 shelves	05
7	Steel lockers 8 holes	06
8	Laboratory furniture having tables having side racks for practical with tiles on top, wooden racks to keeps solution bottles, wash basin with tap & water connection	08 sets
9	Fire extinguishers foam, CO2	04
Aa	Fire buckets on stand	08
11	Artificial respiration chart	04
12	First aid box	01
13	Black board with stand	01
14	Student table	16
15	Student chair without arm	16

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
GENERIC MODULE – PPMBT-07: “ENGINEERING DRAWING”
DURATION -2Hrs Weeks
COURSE CONTENT**

Sl.no	Course content
1	Familiarization with the institute.
2	Introduction to engineering drawing & its importance. Different types of standards used in engineering drawing
3	Drawing instruments & their uses- drawing board, T square, set square, protector, drawing sheet, drawing pencils-grade & selection, eraser. Practice lay out of drawing sheet.
4	Types of lines- thickness, shade of lines & its general application. Draw types of lines of lines as per IS-70714-1983. Draw figures involving horizontal, vertical & inclined lines.
5	Type of angle, triangle and their types.
6	Practical- construct scalene triangle, right angle, isosceles & equilateral triangle.
7	Lettering style-single stroke letters, gothic letters as per IS standards. Lettering practice.
8	Dimensioning- types of dimension, elements of dimension, method of indicating values, arrangement & indication of dimensions.
9	Practice- place dimension in the drawing by aligned system & unidirectional system. Give dimension to given drawing by following dimensioning principles as per BIS. Method of dimension common features.
10	Geometrical construction using drawing instruments-linear, angles, patterns, circle, arc, tangent, quadrilateral, regular polygons, tapers. Related exercise on this topic.
11	Practice- constructs square, rectangle, parallelogram, rhombus, trapezium, and quadrilateral. Draw a regular pentagon by circum scribing & inscribing, regular hexagon by arc method, octagon & various types of tapers.
12	Free hand sketching of straight lines, rectangular, circles, squares, polygons, ellipse & its practice.
13	Orthographic projection I & III angle- simple machine elements, procedure for preparing a scale drawing.
14	Draw a plan, elevation & side view of prism, cylinder, frustum of cone, pyramid.
15	Draw a plan, elevation & side view of object having stepped blocks with curved surfaces in I & III angle.
16	Drawing isometric views out of orthographic views.
17	Draw the isometric projection of cube, hexagonal prism, cylinder, cone, objects/ blocks with curved surfaces.
18	Visualize the shape of object from the given two views and add third view- simple machine element.
19	Identify the lines missed in multi views and supply them, third view for the given two views of similar in shapes & size.
20	Development of regular objects bounded by plane surfaces- cube, prism, cylinder & cones.
21	Draw the development of surfaces of a cube & prism, cylinder, cones.
22	Explanation of full- sectional view, half sectional view, aligned sections.

23	Conventions & symbols used on drawing, abbreviations used on engineering drawing, surface finish symbols, welding symbols & annotation.
24	Blue print reading of various drawings; take out blue print from blue print machine.

**BROAD BASED BASIC TRAINING
(FIRST YEAR)
GENERIC MODULE – PPMBT-08: “WORK SHOP CALCULATION & SCIENCE”**

DURATION- 2 Hrs per Weeks

COURSE CONTENT

Sr No	Course content
1	Units & measurement- system of units, fundamentals & derived units.
2	Conversion of units & applied problems. FPS, CGS, MKS & SI units.
3	Fraction & decimals- addition, subtraction, multiplication & division.
4	Mass, weight, volume & their units. Problems on these, volume of steel, aluminum & copper.
5	Simplification of fraction & decimals.
6	Definition- force, pressure, stress, strain & modulus of elasticity.
7	Square, square. root, cube root
8	Plotting & reading of simple graph.
9	Heat, temperature & conversion of scales. Thermometer, thermocouple, pyrometer & its application. Transmission of heat & Coefficient of thermal expansion of solids, liquid & gas & related problems.
10	Ratio & proportion – mechanical advantage, velocity ratio & efficiency.
11	Simple machines – mechanical advantage, v velocity ratio & efficiency.
12	Mensuration – area of circle, triangle, polygons, surface area, volume of cube, sphere, cone, cylinder, hollow cylinder & prism.
13	Use of logarithms & antilogarithms tables & problems their on multiplication, division, fraction.
14	Newton’s law of motion & related problems. Friction & its kinds – advantages & division, fractions.
15	Estimation & cost of finished products.
16	Classification of ferrous & non ferrous metals & alloys, physical & mechanical properties of metal.
17	Algebraic addition, subtraction, multiplication & division. Simultaneous equation, factors & related problems.
18	Meaning of HP, IHP, BHP, FHP, efficiency, problems on horse power.
19	Trigonometry- ratio, formulae, area of triangle, height & distance by using trigonometry. Pythagoras theorem.
20	Heat treatment – process of annealing, normalizing, hardening, tempering, case hardening, carburizing, nitriding.
21	Basic principles of electricity. Ohms law. Use of switch, fuse, conductor, insulator & semi conductor. Series & parallel circuits.

**LIST OF FURNITURE & TOOLS FOR ENGINEERING DRAWING, WORKSHOP CAL. & SC.
AND THEORY CLASSES**

Sr No.	Particular	Qty.
ENGINEERING DRAWING		
1	Instructor table 1200x760 mm	1
2	Instructor chair with arm	1
3	Student table 600x450x760 mm	20
4	Student chair	20
5	Steel almirah 1980x450x900 mm	2
6	Book shelf	1
7	Mini drafter	17
8	Drawing board 600x450 mm with pins & clips	17
9	Magnetic white board 1500x1200 mm with accessories.	01set
10	Black board with stand	1
THEORY CLASS ROOM		
1	Instructor table 1200x760x760 mm	4
2	Instructor chair with arm	4
3	Student table 600x450x760 mm	80
4	Student chair	80
5	Steel almirah 1980x450x900 mm	4
6	Book shelf	4
7	Magnetic white board 1500x1200 mm with accessories.	04set
8	Black board with stand	4
9	Steel rack	4
10	Over head projector with screen	4