

Upgradation of ITIs into Centers of Excellence-Broad guidelines for implementation of the scheme for “Sector FABRICATION (Fitting & Welding)”

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 conducted by 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 at least 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 come back after some time to seek admission for advanced / specialised training in another module .

ITI pass out trainee of the particular trade(s) from the conventional system can seek admission for advanced/specialised training .As per the approved curricula in the Area/Sector of “**INDUSTRIAL FABRICATI(Fitting & Welding)**”

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 **Sector INDUSTRIAL FABRICATION (Fitting & Welding)”** and space requirement of each module is as under

MODULE NO.	NAME OF THE MODULE	Trade(s) from where existing equipment/instructor could be utilised
FBT-01	BASIC FITTING & MEASUREMENT	Fitter
FBT-02	BASIC SHEET METAL WORK and FASTENING	Sheet Metal Worker
FBT-03	BASIC MACHINE SHOP PRACTICE (Turning , Milling & Grinding)	Machinist

FBT-04	BASIC WELDING	Welder
FBT-05	METALS and SURFACE FINISHING TECHNIQUES	-
FBT-06	BASIC ELECTRICAL , ELECTRONICS & COMPUTER SKILLS	*Electrician/ *Electronic Mechanic /*COPA

***Facilities available in ITIs for trades viz Electrician/ 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.

- FBT-07- WORKSHOP CALCULATION & SCIENCE.....2 hrs/week**
FBT-08-ENGINEERING DRAWING2 hrs/week
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)
FBT – 01 to 06	Six VIs one each for 6 module of relevant trades
FBT-07 & FBT - 08	One VI having Diploma in relevant field
G-01	One contract/part time / guest faculty for Generic module, ENTERPRENEURSHIP AND COMMUNICATION SKILLS –G-01

The eligibility and other criteria will be as follows:

Eligibility : 10th pass under 10+2 system

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, following norms are prescribed only for new infrastructure is to be created .

- (1) Workshop space of 80 Sqm for each basic module
- (2) Three Theory classrooms of 30 Sqm each

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

Suitable Chairs/ tables*	-As required
OHP/Epidiascope	- 1 No.
Laptop computer/PC (latest) & LCD projector**	-1 No.
Magnetic white board	-1 No.
White board	-1 No.
Flip chart	-1 No.
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.

I N D E X

UPGRADATION OF ITIs INTO CENTERS OF EXCELLENCE (CoE)

SECTOR / AREA : **FABRICATION (Fitting & Welding)**

BROAD BASED BASIC TRAINING

(ONE YEAR)

MODULE NO.	NAME OF THE MODULE	DURATION IN WEEKS
I	BASIC FITTING & MEASUREMENT	8 weeks
II	BASIC SHEET METAL WORK and FASTENING	- do -
III	BASIC MACHINE SHOP PRACTICE (Turning , Milling & Grinding)	- do -
IV	BASIC WELDING	- do -
V	METALS and SURFACE FINISHING TECHNIQUES	- do -
VI	BASIC ELECTRICAL , ELECTRONICS & COMPUTER SKILLS	- do -

i	ENGINEERING DRAWING	@ 2 hrs / week 48 weeks
ii	WORKSHOP CALCULATION & SCIENCE	- do -
iii	ENTREPRENEURSHIP AND COMMUNICATION SKILLS (given separately)	- do -

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting & Welding)

BROAD BASED BASIC TRAINING

(One Year)

MODULE - I: BASIC FITTING & MEASUREMENT

(Duration - 8 weeks)

MODULE - I : BASIC FITTING & MEASUREMENT

(Duration - 8 weeks)

I) COURSE CONTENT

Week No.	Practical	Theory
1	<ul style="list-style-type: none"> - Physical introduction to measuring instruments –handling of instruments – exercises in the use of Linear measuring instruments such as Steel rule of different ranges. - Outside & inside calipers for measuring inside, outside parameters. - Vernier calipers - Least count , exercise in outside measurement, inside measurements, depth gauge. 	<ul style="list-style-type: none"> - Introduction to Metrology, Objectives of Metrology – measurements – principles -methods of measurement. - Terminology used in Metrology - Accuracy - Repeatability - Resolution etc. - SI units of measurements – physical quantities under SI system
2	<ul style="list-style-type: none"> - Measurement of flat rectangular objects , cylindrical objects, hollow components, threaded components - Exercises on external & internal measurements using Micrometers and Height gauges 	<ul style="list-style-type: none"> - Selection of measuring instruments, care, use and maintenance of measuring instruments – Handling of precision instruments – Vernier Caliper, Micrometer, Height Gauge, Dial Gauge (Plunger and bevel type) with stand (0.01 mm Resolution), checking squareness using combination set.
3	<ul style="list-style-type: none"> - Introduction to safety including fire equipments and their uses. - Familiarise with Measuring tools - Familiarise with Fitter's hand tools - Filing a flat surface of Mild steel and cast iron. Check for flatness, straightness and squareness 	<ul style="list-style-type: none"> - Fabrication processes in brief. - Out line of various subjects to be covered. - Introduction to hand tools and their safety. - Environmental Factors and Personal Safety
4	<ul style="list-style-type: none"> - Simple blue print reading - Mark out according to simple blue print 	<ul style="list-style-type: none"> - Marking and punching tools and their uses - Hacksaw – types, specification and their uses.

	<ul style="list-style-type: none"> - Punching. - Hack sawing to dimension 	
5	<ul style="list-style-type: none"> - Filing flat and square to size. - Marking and punching of stepped and angular components and finishing the part to the required shape and size. 	<ul style="list-style-type: none"> - Classification and specification of files, shapes, sizes & grades. - Bench vice - constructional details - Selection criteria of files
6	<ul style="list-style-type: none"> - Center drilling, drilling, reaming, counter sinking, counter boring, tapping and die passing for various sizes of mild steel and tapping on various sizes of mild steel material 	<ul style="list-style-type: none"> - Drilling machine - Types - Drilling operation - Drill bits. - Reamers – types, care and maintenance
7	<ul style="list-style-type: none"> - Fitting exercises – simple to complex (Involving drilling, tapping, reaming, counter sinking, counter boring and slide fitting.) 	<ul style="list-style-type: none"> - Taps and Dies – Description, care and maintenance - Lubrication for tapping - Determination of drill size for tapping - Selection of Spindle RPM for drilling - Tool holding and work holding devices - Types of Fasteners - Standard size of threads, types
8	<ul style="list-style-type: none"> - Fabricating of different components individually and assembling with fasteners 	<ul style="list-style-type: none"> - Limits and fits according to IS: 919

II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

SI No	Item	Qty
01	Steel rule 30 cm graduated both in English & Metric units	17 Nos.
02	Outside spring caliper 150 mm	17 Nos.
03	Inside spring caliper 150 mm	17 Nos.
04	Hermaphrodite caliper 150 mm	17 Nos.
05	Divider spring 150 mm	17 Nos.
06	Centre punch 100 mm	17 Nos.

SI No	Item	Qty
28	Hammer B.P. 800 gms with handle	6 Nos.
29	Screw driver, heavy duty 300mm with handle	4 Nos.
30	Hammer lead 1 Kg	2 Nos
31	Combination set 300mm	2Nos
32	Spindle blade screw driver 100mm	2 Nos.
33	Allen hexagonal keys 2.5 to 12	2 sets

07	Hammer B.P. 0.5 kg	17 Nos.
08	Combination plier 150mm	17 Nos.
09	Safety glasses	17 Nos
10	File flat bastard 300mm	17 Nos
11	File flat 2 nd cut 250 mm	17 Nos.
12	Engineers screw driver	17 Nos.
13	File flat smooth 200 mm	17 Nos
14	Cold chisel flat 25 x 200 mm	17 Nos.

Tools, Instruments and General Shop Out fits

15	Granite Surface plate 1000mm x 630 mm grade 1	4Nos
16	Metal stand Table for surface plate 900 x 900 x 1200mm	4Nos
17	Screw Driver Set (multiheads)	1Set
18	Scribing block universal 300mm	2Nos
19	Vee Block universal 300mm	2Nos
20	Try square 150 mm	2Nos
21	Outside spring caliper 200 mm	2Nos
22	Divider spring 200mm	2Nos
23	Inside spring caliper 200mm	2Nos
24	Straight edge steel 1 metre	1No
25	Straight edge steel 500 mm	1No
26	Steel tape 2 metre in case	1No
27	Spirit level 2V 250, 05 metre	1 No

SI No	Item	Qty
56	Reamer 6 mm to 13mm by 1 mm	1 set
57	Hacksaw adjustable 250 – 300 mm with blades	8 Nos.
58	Hand vice 50 mm jaw	2 Nos.
59	Magnifying glass 75 mm	2 Nos.

Measuring Instruments

60	Micrometer outside 0-25 mm	4 Nos.
61	Micrometer outside 25 – 50mm	4 Nos
62	Micrometer outside 50 – 75mm	2 No

34	Spanner D.E.C.P. series 2(7 pcs. each)	6setsof
35	Adjustable spanner 12 Nos	3 Nos.
36	Reduction sleeve MT as required	1Set
37	Angle plate size 200 x 100 x 200mm	2 Nos.
38	Angle plate adjustable 250 x 150 x 175	2 Nos.
39	Solid parallels in pairs (Different sizes) in Metric	12 pairs
40	Oil can pressure feed 500 mg	6 Nos.
41	Oil stone 150 x 50 x 25 mm	2 Nos.
42	Twist drills 3mm to 13mm (Parallel Shank)	1 set
43	Drill chuck 0 -20 with taper shank	1 No.
44	Centre drill A1 to 5	2 sets
45	Grinding wheel dresser (star type)	1No.
46	Clamps C 100mm	2 Nos.
47	Clamps C 200mm	2 Nos.
48	Tap and die set in box metric pitch	1 set
49	Drill HSS taper shank	1 set
50	File flat 2 nd cut 250 mm	4 Nos.
51	File flat smooth 200mm	4 Nos.
52	File H/R 2 nd cut 250 mm	4 Nos
53	File triangular smooth 200mm	4 Nos.
54	Needle file set	1 No.
55	File square 2 nd cut 250mm	4 Nos.

SI No	Item	Qty
67	Dial Gauge	4 Nos
68	Lever Type dial gauge	4 Nos
69	Dial gauge stand	4 Nos
70	Screw pitch gauge for metric pitches (0.5 to 7 mm)	2 sets
71	Radius gauge metric set (1-6mm)	1 set
72	Feeler gauge	1 No.

General installation

73	Sensitive Drilling machine pillar 12mm capacity with accessories	2 No
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63	Micrometer depth gauge 0-150mm	8Nos
64	Direct reading Vernier caliper 0 to 300	4 Nos
65	Vernier height gauge 250 mm	1 No
66	Vernier bevel protractor with least count of 5 minutes	1 No.

74	Radial drill 1200mm motorized with tapping attachment	1 No.
75	Drilling machine pillar 20mm capacity with accessories	1 No
76	Pedestal grinder	1 No
77	Hand Drilling Machine Power (10 mm)	1 no

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting & Welding)

BROAD BASED BASIC TRAINING

(One Year)

MODULE - II : BASIC SHEET METAL WORK and FASTENING

(Duration - 8 weeks)

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I) COURSE CONTENT

a) Sheet Metal Work - 6 weeks

b) Fastening - 2 weeks

Week No.	Practical	Theory
1	<ul style="list-style-type: none"> - Safety in shop floor - Tools & equipments – Safety - Identification and uses of tools & accessories – Mallets, nylon hammers, bench vice, sheet formers, strips and shears etc. 	<ul style="list-style-type: none"> - Safety precautions to be observed in the workshop - Importance of sheet metal work in Industry - Measuring & marking tools – Try square, dividers, trammels, marking block, scribe, steel rules, calipers, SWG and their uses
2	<ul style="list-style-type: none"> - Practice in scribing of straight line, bisection of straight lines with marking tools - Planishing of sheet metal - Practice on hand soldering method (Lead & Tin) 	<ul style="list-style-type: none"> - Sheet metal Classification and uses, cutting methods - straight cutting, circle cutting - Louver cutting, Nibbling, Slot cutting & Notching - Sheet metal works – Folding, Bending, Flanging, etc.. - Solder – Different types of solder and their uses (Soft & Hard solder) Heating appliances.
3	<ul style="list-style-type: none"> - Practice in cutting sheet metal to different shapes using various types of snips & Nibbling machines - Folding / bending sheet metal 90° using wooden mallet 	<ul style="list-style-type: none"> - Description of Folding & bending machines - Description & used of guillotine shears and circle cutting machines. - Description and use of hand punching machine Description of Drilling machine, Drill bit etc.,
4	<ul style="list-style-type: none"> - Practice on removing Dents of spherical and hemi spherical articles. - Practice on cutting cylinder obliquely to make 90° L piece with equal diameter and join them at right angle. 	<ul style="list-style-type: none"> - Methods of Laying out pattern - Parallel line method - Radius line method

		<ul style="list-style-type: none"> - Triangular line method - Laying out pattern of cylinder cut obliquely
5	<ul style="list-style-type: none"> - Riveting – Identification of Rivets – Selection of Rivets and Riveting practice for zig zag, chain Diamond Riveting 	<ul style="list-style-type: none"> - Various types of Rivets, Riveting methods and application, Part of Rivets, Rivet materials, Joints types, Advantages and disadvantages of Riveting.
6	<ul style="list-style-type: none"> - Identification of fasteners used on sheet metal works - Fabrication by threaded Fasteners – Simple joints. 	<ul style="list-style-type: none"> - Fastening of sheet metal - Various types of fastening devices, Various types of fastening, Permanent / Semi permanent - Types of screws, washers, bolts and nuts, etc..
7	<ul style="list-style-type: none"> - Practice on sheet metal - Seams, Grooved seam, Locked Grooved Seam, Pane down seam, Bottom Lock seam, Clip Lock, Double bottom Lock, Scrap joint etc., - Tube bending by hand making 60° off set " T " piece (round) 	<ul style="list-style-type: none"> - Clips and connections - Their uses, Types and allowance of clips . Government clips, Drive clip, Mailing clip etc., - Introduction to tube & pipe - Pipe bending machine manual operation and application on pipe bending
8	<ul style="list-style-type: none"> - Exercise involving practical work on Aluminium sheet, using Pop Rivet, Aluminium Windows with extruded sections. - Make simple railing square frame doors. - Making a dust pan cover and handle riveted 	<ul style="list-style-type: none"> - Kinds of Aluminium Frames, Square, Rails, beads, angles etc., - Fastening system of making Doors, Windows, fixing locks etc.,

II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

SI No	Item	Qty
LIST OF HAND TOOLS		
1	Steel Rule 300 mm	17
2	Wing Divider 200 mm	17
3	Centre Punch 100 mm	17
4	Spring Dividers 150 mm	17
5	Ordinary Wooden Mallet 50 mm	17
6	Cross Peen Hammer 0.25 Kg with handle	17
7	Protractor with blade 150 mm	17
8	Steel Tape 2 meters	17
9	Ballpane Hammer 0.5 Kg with handle	17
10	Scriber 150mm x 3 mm (Engineers)	17
SHOP OUT FIT		
11	Steel Square 450mm x 600 mm	4 Nos.
12	Sheet Metal Gauge	2Nos.
13	Stake Round and Bottom	4 Nos.
14	Half Moon Stake	4 Nos.
15	Funnel Stake	4 Nos.
16	Anvil Face Stake	4 Nos.
17	Bick Iron stake	4 Nos.
18	Tinmans Horse	2 Nos.
19	Hammer Peaning with handle	4 Nos.
20	Hammer Creasing with handle	4 Nos.
21	Hammer Planishing with handle	4 Nos.
22	Hammer Block with handle	2 Nos.
23	Sher Tinmans 300 mm	8 Nos.
SI No	Item	Qty
49	Vernier caliper (0mm – 150mm)	1 No.

SI No	Item	Qty
24	Snips straight 250 mm	8 Nos.
25	Right cut snips 250 mm	4 Nos.
26	Left cut Snips 250 mm	4 Nos.
27	Hand Shear Universal 250 mm	4 Nos.
28	Punch Round 3 mm , 4mm & 6mm Dia	4 Nos
29	Punch Round 4 mm Dia	4 Nos
30	Punch Round 6 mm Dia	4 Nos
31	Rivet sets snap and Dolly combined 3 mm ,4 mm, 6mm	4 each
32	Chisel cold flat 25 mm x 250 mm	4 Nos
33	Punch Letter 4mm and Punch Number 4 mm	1 set each
34	File flat 250 mm second cut and smooth	2 each
35	File flat 250 mm smooth	2 Nos.
36	File flat 300 mm bastard	2 Nos.
37	File half round 300mm smooth	2 Nos
38	Hacksaw frame 300 mm adjustable (tubular)	4 Nos.
39	Hand Groover 3 mm, 4mm, 5mm	4 Nos.
40	Plier Combination 150 mm	2 Nos
41	Grip Wrench 200mm	2 Nos
42	Ladle 150 mm Dia	2 Nos
43	Blow Lamp 1 litre	2 Nos
44	H.S.S. Twist Drill 3 mm, 4mm & 6 mm (Parallel Shank)	3 each
45	Hand Drill 0 to 6 mm, 8mm, 10mm & 12mm	2 each
46	Soldering Copper Hatchet type 500 gms	8 Nos
47	Pneumatic rivet gun	2 Nos.
48	Trammel Point (with beam 600 mm)	1 No.
SI No	Item	Qty
75	Liquified Petroleum Gas (LPG) Cylinder, Regulator and	2 Nos.

50	Micrometer outside (0 to 25mm)	1 No.
51	Raspcut file 250 mm	4 Nos.
52	D.E.Spanner G.P (6 mm to 32 mm) (Set of 12 spanner)	2 set
53	Bessing Mallet	4 Nos
54	Endfaked Mallet	4 Nos
55	Soft Hammer (Brass, Copper, Lead, Rubber and Rawhide heads with handle)	4 Nos
56	Steel Rule 600mm	4 Nos
57	Oil Can Pressure feed 500 ml	2 Nos
58	Raising Hammer with handle	4 Nos
59	Rawl Punch holder and bits (No.8,10, 12,14)	2 sets
60	Hollowing Hammbor with handle	4 Nos
61	Tripaning tool 70mm	1 No.
62	Safety Glasses	4 pairs
63	Handvice 50mm	16 Nos.
64	Portable Electric drill (Single phase)	2 Nos.
65	Crow bar 910 x 25mm	2Nos.
66	Trowel Medium	1 No.
67	Trowel small	1No.
68	Poprivet gun	2 Nos.
69	Lazy Tong	2 Nos.
70	Screw Driver 250mm	2 Nos.
71	Round File 2 nd Cut 250mm	4 Nos.
72	Triangular File Smooth 250mm	4 Nos.
73	Square File 2 nd Cut 250mm	4 Nos.
GENERAL INSTALLATION		
74	Light General purpose portable forge	2 Nos.

	Torch with Burner	
76	Bench lever shears 250mm Blade x 3 mm Capacity	1 No.
77	Air Compressor (Pressure and displacement of air)	1 No.
78	Spray Gun (Painting) 500 ml	1 No.
79	Pillar type drilling machine 12mm	1 No.
80	Circle Cutting Machine 300 mm Dia	1 No
81	Guillotine Shearing Machine foot operated (1 mt x 18G Capacity)	1 No.
82	Slip roll former 1.6mm x 1000 mm	1 No.
83	D.E. Grinder Pedestal motorized 200 mm	1 No.
84	Anvil 50 Kgs with Stand	1 No.
85	Bench vice 120mm, 150mm	2 each
86	Fly press/Ball press No.4 single body	1 No.
87	Buffing and Polishing Machine	1 No.
88	Nibbling Machine	1 No.
89	Spinning Lathe	1 No.
90	Seaming Machine	1 No
91	Black Board with Easel	1 No
92	Wooden Rule 450 mm	1 No.
93	Portable Nibbler	2 Nos.
94	Portable Pneumatic Shear	2 Nos.
95	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1 No.
96	Hand Press Brake Capacity (0.8mm)	1 No.
97	Ag4 & AG 7 hand grinders	1 each
98	Spot Welding Machine	1 No.
99	Tin smiths bench folder 600 x 1.6mm	1 No.
100	Beading Machine with 380mm throat clearance (with crimping rollers)	1 No

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting & Welding)

BROAD BASED BASIC TRAINING

(One Year)

MODULE - III : BASIC MACHINE SHOP PRACTICE (Turning, Milling &Grinding)

(Duration - 8 weeks)

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(Duration - 8 weeks)

I) COURSE CONTENT

a) Turning - 3 weeks

b) Milling - 3 weeks

c) Grinding - 2 weeks

WEEK NO	Practical	Theory
1	<ul style="list-style-type: none"> - Manufacturing process and their importance in Industries - Introduction to an Engine Lathe, identification of different parts of engine lathe, holding the job in 3 jaw chuck, - Perform facing and plain turning operation to an accuracy of $\pm 0.1\text{mm}$ 	<ul style="list-style-type: none"> - Manufacturing processes in brief - Outline of various subject to be covered - Disciplinary rules of the Institute, Training and other facilities available. - Introduction to Lathe, description - Lathe types – construction – parts and functions <p>Specification of a centre lathe, lathe operations</p>
2	<ul style="list-style-type: none"> - Hold round job on independent chuck & perform the following operations - Facing, Plain turning, Step turning, Taper turning - Turn an angular surface – By compound slide method. - Setting a grooving tool & performing an undercutting operation for threading - Perform Chamfering operation - Setting a threading tool and cutting a 'V' thread 	<ul style="list-style-type: none"> - Work holding devices – Mounting, dismounting procedure and their safety. - Lathe tools, their angles for roughing and finishing operation - Taper – types and uses - Calculation on taper - Different methods of producing a taper on a lathe, their merits & demerits <p>Types of threads, forms of thread and depth calculation.</p>
3	<ul style="list-style-type: none"> - Performing center drilling, drilling and boring operation. - Cutting "V" thread on through bore. - Performing parting off operation - Performing knurling operation - Demo on parallel turning between centers. 	<ul style="list-style-type: none"> - Calculation of spindle speeds, feeds & depth of cut for different lathe operations. - Method of producing a thread on a lathe. - Cutting tool materials - Types of coolants and their applications
4	<ul style="list-style-type: none"> - Horizontal milling machine - Identifying different parts, importance of each part - work holding devices and hand tools 	<ul style="list-style-type: none"> - Milling machine - description - construction - types - specifications and applications.

	<ul style="list-style-type: none"> - Mill a plain surface using plain milling cutter / slab milling cutter and Checking the flatness with tri-square. <p>Milling six faces of a cuboidal block using plain milling cutter to an accuracy of ± 0.1mm. Checking the squareness with trisquare and the size with vernier.</p>	<ul style="list-style-type: none"> - Merits and demerits of different types of milling machine - Work holding devices and cutter holding devices. - Processes of milling – upmilling, down milling, face milling and end milling.
5	<ul style="list-style-type: none"> - Step milling using side and face milling cutter. - Angular milling using angular milling cutter and checking with bevel protractor. - Slot milling using slot milling cutter / slitting saw. - Vertical milling machine:- Familiarisation and mounting of face milling cutter on a vertical milling machine. - Face mill using face milling cutter 	<ul style="list-style-type: none"> - Classification of different types of milling cutters and their uses. - Nomenclature of milling cutters. - Selection of cutting speed, feed and depth of cut for different milling Operations.
6	<ul style="list-style-type: none"> - Step milling using end mill. - Slot milling using a slot drill - Milling angular surface by tilting the spindle head & universal vice - Milling a hexagon / square on a round rod using direct indexing. - Milling a tung and groove and matching. 	<ul style="list-style-type: none"> - Method of producing angular surface using vertical and horizontal milling machines. - Milling of formed surfaces – concave and convex. - Dividing head – types, parts, function and uses. - Calculation of direct indexing to mill a polygon.
7	<ul style="list-style-type: none"> - Safety precautions to be followed in grinding - Re-sharpening of plain turning tool on pedestal grinder to an accuracy of one degree. - Check the tool angle using bevel protractor. - Familiarize with controls of surface grinding machine 	<ul style="list-style-type: none"> - Grinding - Principle, types of grinding machine and their uses. - Safety in grinding operation
8	<ul style="list-style-type: none"> - Preparation of edges for welding / Fitup using portable grinder 	<ul style="list-style-type: none"> - Grinding wheels - Types of abrasives, grain size, grade, structure, bond types, standard marking system & selection criteria. - Types of portable grinder – pneumatic & electrical.

II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

SI No	Item	Qty
TRAINEES TOOL KIT		
1	Steel rule 30 cm graduated both in English & Metric units	17 Nos
2	Outside spring caliper 150 mm	17 Nos.
3	Inside spring caliper 150 mm	17 Nos
4	Hermaphrodite caliper 150 mm	17 Nos.
5	Divider spring 150 mm	17 Nos.
6	Centre punch 100 mm	17 Nos.
7	Hammer B P 0.5 Kg	17 Nos
8	Combination plier 150 mm	17 Nos
9	Safety goggle	17 Nos
10	File flat bastard 300mm	17 Nos
11	File flat 2 nd cut 250 mm	17 Nos
12	Engineers screw driver	17 Nos
13	File Flat smooth 200 mm	17 Nos
Tools, Instruments and General Shop Out fits		
11	Surface plate 900 x 900 x 1200 mm with Table	1 No.
12	Marking off table 1200 x 1200 x 900mm high	1 No.
13	Scribing block universal 300 mm	2 Nos.
14	" V " block 100/7-80-A	2 Nos.
15	Try Square 150 mm	2 Nos.
16	Outside spring caliper 200 mm	2 Nos.
17	Divider spring 200 mm	2 Nos.
18	Steel rule 60 cm graduated both in English and Metric units	2 Nos.
19	Spirit level 2V 250, 05 metre	1 No.
20	Hammer B P 800 gms with handle	12 Nos.
21	Screw Driver, heavy duty 300 mm with handle	4 Nos.
22	Combination set 300 mm	1 No.

SI No	Item	Qty
23	Reduction sleeve MT (to suit the machine)	1 set
24	Spanner D.E.G.P series 2	6 sets
25	Solid parallels in pairs (Different sizes) in Metric	4 pairs
26	Oil can pressure feed 500 mg	6 Nos.
27	Oil stone 150 x 50 x 25 mm	2 Nos.
28	Twist Drill Taper shank set 12 to 20 mm in step of 1 mm	2 sets
29	Twist drills& Drill chucks including keyless drill chuck	1 set
30	Assorted carbide lathe tools with holder different shapes and sizes	As Reqd.
31	Hacksaw frame adjustable 250 - 300mm with blades	2 Nos.
32	Plier cutting 200 mm	2 Nos.
33	Hand hammer 1 Kg with handle	2 Nos.
34	Centre drill 2,3,& 4	4 Sets
36	Cylindrical cutter dia 63 x 90 x bore dia 27mm	2 Nos.
37	Cylindrical cutter dia 80 x 90 x bore dia 27mm	2 Nos.
38	Side and face cutter A 80 x 8 x bore dia 22mm	2 Nos.
39	Side and face cutter A 160 x 10 x bore dia 27mm	3 Nos.
40	Side and face cutter A 100 x 12 x bore dia 32mm	2 Nos.
41	Side and face cutter B 160 x 16 x bore dia 32mm	2 Nos.
42	Side and face cutter A 200 x 20 x bore dia 32mm	3 Nos.
43	Side and face cutter A 100 x 10 x bore dia 32mm	2 Nos.
44	Equal angle cutter 45°/ 100 x bore dia 16 mm	2 Nos.
45	Face mill dia 30 with 2sets of carbide inserts	2 Nos.
46	Face mill dia 40 with 2sets of carbide inserts	2 Nos.
47	Face mill dia 80 with 2sets of carbide inserts	2 Nos.
48	Shell end mill dia 50 – 27 bore	2 Nos.
49	Shell end mill dia 80 – 32 bore	2 Nos.
50	Parallel of shank end mill dia 6, 8, 10 & 12	4 each

SI No	Item	Qty
51	Single angle cutter 63 x 18 x 70° RH	1 No.
52	End mill parallel shank dia 16	2 Nos.
53	End mill parallel shank dia 18	2 Nos.
54	End mill parallel shank dia 20	2 Nos.
MEASURING INSTRUMENTS		
55	Micrometer outside 0-25 mm	4 Nos.
56	Micrometer outside 25 - 50 mm	2 Nos.
57	Micrometer depth gauge 0 – 200 mm	1 No.
58	Direct reading Vernier caliper B 300 (direct reading with dial)	1 No.
59	Vernier height gauge 300 mm	1 No.

SI No	Item	Qty
60	Vernier bevel protractor with 150 mm blade	1 No.
61	Bevel gauge 200 mm	1 No.
62	Telescopic gauge 13 mm to 300 mm	1 set
63	Compound dial gauge with stand (Metric)	1 No.
64	Dial test indicator with magnetic gauge type 1 grade A with magnetic base	1 No.
65	Screw pitch gauge for metric pitches (0.5 to 6mm)	2 sets
66	Radius gauge metric set (1- 6 mm)	1 set
67	Taper gauge M T No. 1,2,3,4, & 5	1 set
68	3 pin micrometer 10 – 25 mm	2 Nos.

GENERAL INSTALLATION

SI. No.	Item	Qty
69	Lathe General purpose all geared (gap bed), height of centres 150 mm, bed length 1500 mm with 3 jaw & 4 jaw chuck, face plate, taper turning attachment steadies etc., and set of lathe tool holders.	4 Nos.
70	Pedestal grinder, double ended with 170mm wheels (one fine and one rough)	2 No.
71	Milling machine universal(horizontal), machine size No.1 with standard accessories and the following attachments: i. Universal dividing head with set of change gears - 1 No ii. Long arbors dia 16, 22, 27 and 32 mm - 1 each iii. Machine vice swivel base 150mm - 1 No	1 set
72	Milling machine plain type – horizontal, machine size No.1 with standard accessories and the following attachments: i. Machine vice swivel base 150 mm - 1No ii. Long arbor dia 16, 22, 27 and 32 mm - 1 each	2 sets.
73	Milling machine vertical, machine size No.1 with standard accessories and the following attachments: i. Machine vice plain 150 mm - 1No	2 sets.

	ii. Collet adaptor and collets (standard size) - 1set iii. Stub arbor, style 'C' dia 22, 27 and 32 mm - 1each iv. Rotary table 300mm with indexing arrangement - 1No v. Boring head - 1 No.	
74	Pedestal grinder, double ended with 170mm wheels (one fine and one rough)	2 Nos.
75	Angle grinder 7"	2 Nos.

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting & Welding)

(ONE YEAR)

BROAD BASED BASIC TRAINING

(One Year)

MODULE - IV : BASIC WELDING

(Duration - 8 weeks)

MODULE - IV : BASIC WELDING

(Duration - 8 weeks)

I) COURSE CONTENT

Week No.	Practical	Theory
1	<ul style="list-style-type: none"> - Safety in Shop floor - Identification of tools and accessories used for Gas and Arc welding - Setting up of Gas Welding Plant - Opening and closing procedure of gas welding plant - Lighting and adjustment of Oxy-Acetylene flame - Beading practice on MS sheet with and without filler rod 	<ul style="list-style-type: none"> - Types of welding processes and application - Nomenclature of Fillet and groove welds - Welding terms and definitions - Oxy-Acetylene welding plant – description operating procedures, safety etc. - Types of metals and characteristics
2	<ul style="list-style-type: none"> - Setting up Arc Welding plant - Striking an Arc and depositing straight and weaving beads on MS in Flat position 	<ul style="list-style-type: none"> - Principles of shielded Metal Arc welding its advantages and limitations. - Tools, accessories and equipment for SMAW - Types of welding joints and edge preparation - Safety precaution in Arc welding
3	<ul style="list-style-type: none"> - Close square butt joint – on M.S. Sheet by gas welding in flat position - Open square butt join on M.S. sheet by gas welding in flat position - Fillet T joint on M.S. Sheet by gas welding in flat position 	<ul style="list-style-type: none"> - Types of Oxy-Acetylene flames and their uses. - Chemistry of Oxy-Acetylene and flame temperatures - Oxy-Acetylene regulators – description and safe operating procedures - Oxy Acetylene welding blow pipes types description care and maintenance - Oxy Acetylene welding parameters – Blow pipe size, pressure setting and filler rod size for different sheet thickness

4	<ul style="list-style-type: none"> - Setting up Oxy Acetylene cutting plant and practicing gas cutting on M.S. plate - Filler 'T' joint on M.S. flat by SMAW in flat position - Fillet lap joint on M.S. by SMAW in flat position 	<ul style="list-style-type: none"> - Principles of Oxy Acetylene cutting process - Selection of blow pipe size, pressure setting for various thickness of MS plates - Types & function of flux of shielded Metal Arc Welding electrodes and coating factor - Coding of SMAW electrodes as per BIS/AWS - Selection criteria of electrode types and diameter - Principle of welding Arc, its characteristics and Arc length - Arc welding procedure and technique
5	<ul style="list-style-type: none"> - Outside and Inside corner joint – on M.S sheet by gas welding in flat position - Brazing with Oxy-Acetylene flame - Silver soldering and Oxy-Acetylene flame 	<ul style="list-style-type: none"> - Welding positions and their significance - Filler rods and fluxes for brazing and soldering Gas Welding Techniques - Distortion and methods of control
6	<ul style="list-style-type: none"> - Inside corner joint on MS by SMAW in flat positions - Outside corner joint on MS by SMAW in flat position - Single 'V' but joint on MS by SMAW in flat position 	<ul style="list-style-type: none"> - Basic Electricity applicable to welding - Arc welding power source, AC Transformers, DC welding rectifier, Dc welding generator and their features - Care and maintenance of welding power source - Polarity – types and application
7	<ul style="list-style-type: none"> - Pipe butt joint on MS pipe by Oxy-Acetylene welding in 1G position - Pipe to Sheet flange joint on MS by Oxy – Acetylene welding in horizontal – vertical position 	<ul style="list-style-type: none"> - Arc blow and its control - Metals and their Weldability - Necessity of pre-heating and post heating while welding alloy steels
8	<ul style="list-style-type: none"> - Pipe butt joint on MS pipe by SMAW in 1 G position - Pipe to plate flange joint on MS by SMAW in horizontal – vertical position 	<ul style="list-style-type: none"> - Welding defects causes and remedy - Inspection and testing of welding

II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	17 Nos
2	Apron leather	17 Nos
3	Screen welding helmet type	17 Nos
4	Screen welding hand	17 Nos
5	Goggles pair welder	17 Nos
6	Hammer scaling 0.25 kg. With handle	17 Nos
7	Chisel cold flat 19 mm	17 Nos
8	Centre punch 9mm x 127 mm	17 Nos
9	Dividers 20 cm	17 Nos
10	Caliper outside 15 cm	17 Nos
11	Rule 60 cm two fold brass tipped to read inches and mm	17 Nos
12	Wire brush (M.S)	17 Nos
13	Spark lighter	17 Nos
14	Chipping screen hand	17 Nos
15	Safety boots for welders	17 Nos
16	Safety goggles	17 Nos
17	Square blade 15 cm	17 Nos
18	Scriber 15 cm	17 Nos
19	Tongs holding 30 cm	17 Nos
20	Wire brush (S.S)	17 Nos

Sl. No.	Description of tools	QTY
List of Shop Outfit		
21	Brass Rule 30 cm or nickel chrome steel rule 30 cm	4
22	Hammer ball pin 1 Kg with handle	4
23	Chisel cold cross 9 mm	1
24	Screw Driver 25 cm blade and 20 cm blade	1 each
25	Leg vice on stand 150 mm	1
26	Number punch 6 mm and letter punch 6 mm	1 set
27	Hacksaw frame adjustable 30 cm	4
28	Hammering blocks 5 cm thick 60 sq	2
29	Magnifying glass x 6	4
30	Weld measuring gauge fillet and butt	2
31	File half round bastard 30 cm	6
32	File flat 35 cm rough	6
33	Spanner 12 mm and 15 mm double ended	4
34	Spanner D E 6 mm to 15 mm be 1.5 mm set of Nos.	1 set
35	Clamps 10 cm 15 cm 20 cm 30 cm	2 each
36	Hammer sledge double faced 3 Kg.	1
37	Pipe wrench 25 cm and 35 cm	1 each
38	Steel tape 182 cm flexible in case	1
39	"Tinmans" square 60cm x 30 cm	1
40	Welding torches with 10 nozzles	6 set

Sl. No.	Description of tools	QTY
41	Earth clamps	12
42	Pipe Cutter	1 set
43	Cutting torch Oxy-Acetylene with cutting nozzle	2 set
44	Heavy duty cutting, blow pipe with cutting nozzles	1 set
45	Electrode holder 400 amps	6
46	Welding rubber hose, oxygen and acetylene 8 mm	100 mte
47	Rubber hose clips	50
48	Spindle key (for opening cylinder valve)	8
49	Pressure regulator oxygen double stage	8
50	Pressure regulator acetylene Regulators	8
51	Tip cleaner	8
52	Glasses coloured 108 x 82 x 3 mm DIN 9A 11 A & 13 A	16 each
53	Glass white 108 mm x 82 mm	20 dozen
54	Outfit spanner	8
55	Rubber hose pipe black and red 5 mm	30 mte
56	Leather sleeves	16 pairs
List of General Installation		
57	Transformer welding set with all accessories 300 A	2 sets
58	Arc welding set Rectifier type 400 Amps with all accessories.	2 sets
59	Welding cables to carry 400 amps with flexible rubber	50 mte

Sl. No.	Description of tools	QTY
60	Lugs for Cables	4 nos
61	Gas welding table 822 x 92 cm + 60 cm fire bricks on stand	3
62	Arc welding table all metal with positioner	6
63	Trolley for cylinder (H P unit)	2
64	Bench shear hand capacity up to 5 mm	1
65	D E grinder 30 cm wheel motorized Pedestal type	1
66	Vice bench 10 cm	6
67	Power hacksaw	1
68	Electrode drying oven Temp. range 0-250° C, 10Kg cap.	1
69	AG 7 Grinder & AG4	2 each
70	Portable drilling machine (Cap. 6 mm)	1
71	Welding helmets	16
72	Steel lockers with 8 pigeon holes	2
73	Personnel Computer with latest profile	1
74	Welding CDs (Processes and Inspection methods)	1 set
75	Fibre Welding booth & welding screen	8 each
76	Fume extractors	4
77	Oxygen, Acetylene, Argon & Co ₂ cylinders	2 each
78	Fire fighting equipment & First aid box	As required

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

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UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting &Welding)

BROAD BASED BASIC TRAINING

(First Year)

MODULE - V : METALS AND SURFACE FINISHING TECHNIQUES

(Duration - 8 weeks)

MODULE - V : METALS AND SURFACE FINISHING TECHNIQUES
(Duration - 8 weeks)

I) COURSE CONTENT

a) Sheet Metal Work - 3 weeks

b) Welding - 5 weeks

Week No.	Practical	Theory
1	<ul style="list-style-type: none"> - Induction training – familiarization with the Institute - Introduction to Industrial safety equipments & use - Identification of tools & equipments used in the section 	<ul style="list-style-type: none"> - Importance of the trade - Metals – ferrous, non-ferrous, physical and Mechanical Properties – Weldable and non-weldable metal - Indian Standard specification for metals
2	<ul style="list-style-type: none"> - Identification of metals - Sound Test for metal Identification - Simple spark Test with pedestal grinder for metal Identification 	<ul style="list-style-type: none"> - Cast iron – its properties and applications - Steel and their classification, composition, properties & uses - Aluminium and its properties
3	<ul style="list-style-type: none"> - Measuring hardness of metals with Rockwell hardness and Brinell hardness testing machine - Measuring Tensile strength of metals using UTM - Measuring Impact strength of metals with Impact Testing machine 	<ul style="list-style-type: none"> - Principle and operation of hardness testing machine, brinell hardness & Vickers hardness testing machine - Physical and Mechanical properties of metal – Hardness, Tenacity, toughness, Brittleness, Ductility, malleability etc - Strength of metals – Tensile strength, Impact strength, Shear strength, compressive strength etc. - Identification of steels by spark test - Colour code of metal - ISI specification of metals
4	<ul style="list-style-type: none"> - Operation of furnace and their controls - Study of Temperature measuring Instruments 	<ul style="list-style-type: none"> - Safety precaution to be observed in heat treatment shop. - Need of heat treatment - Different HT processes – Annealing

	<ul style="list-style-type: none"> - Simple H T using Muffle furnace (Hardening & Tempering). - Practice of stress relieving on welded components. 	<p>,Normalizing, Hardening, Tempering, Stress relieving , case hardening etc.</p> <ul style="list-style-type: none"> - Types of furnaces - Necessity of pre heating and post heating - Quenching methods – Iron Carbon phase diagram for plain carbon steel – critical temp. The structure of alpha, gamma and delta iron. - Allotropic transformation of iron - eutectoid – hypoeutectoid & hypereutectoid iron.
5	<ul style="list-style-type: none"> - Identification of defects on welding , Castings, Forgings etc. by Visual inspection - Practice on Non Destructive testing methods - Dye Penetrant Testing - Magnetic Particle Testing 	<ul style="list-style-type: none"> - Surface defect on Casting, Forging & Weldments – - Surface Inspection Testing - Visual Inspection of defects - Non Destructive testing methods - Dye Penetrant Testing - Magnetic Particle Testing
6	<ul style="list-style-type: none"> - Use of tools for surface finishing - Scrapping practice using Scrapping knives, chisel knife, moulding knife, pallet knife, wire brush, emery sheet etc 	<ul style="list-style-type: none"> - Need for surface finishing - Safety precaution - Safety of the painter, safety of paint in storage - Painter hand tools and equipments - Painting Procedure - Surface cleaning of metals for removing oil / grease, rust, dust, moisture, old paint, mud / clay , spatters etc.
7	<ul style="list-style-type: none"> - Painting Practice - application of putty , using putty knife etc- before painting - Practice on application on primer. - Painting practice – Brush painting – Dip painting – Roller painting – spray painting - Polishing & buffing 	<ul style="list-style-type: none"> - Surface preparation methods - use of emulsifiers, Solvent cleaning , Water washing, Abrasive cleaning, Chemical cleanings, Sand blasting, Short blasting etc., - Polishing -Polishing with compound and cloth wheels, Polishing with abrasive covered wheels, polishing with coated wheels - Buffing – buffing materials – Pumice, Tripoli, rouge, whiting and satin finish
8	<ul style="list-style-type: none"> - Phosphating practice on metals 	<ul style="list-style-type: none"> - Types of primer and its application.

<ul style="list-style-type: none"> - Practice on powder coating and drying - Stencilling & Marking Practice - Practice on finishing operation by 0 - micron emery , polishing by wax etc - Inspection of paint by Elcometer and Glassometer 	<ul style="list-style-type: none"> - Types of paint & its application - Finishing Process - usage of blow lamp and drier oven heating etc., - Testing of painted area by Elcometer, Glassometer, etc., - Stencilling & marking - Phosphating of components - Powder coating Process and its use Cleaning and preparation of components for powder coating
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II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

SI No	Item	Qty
1	Goggles	17
2	Gloves	17
3	Apron leather 105 cm	17
4	Mask	17
5	Air buds	17
6	Over coat	17
7	Chisel cold flat 2.5 x 20 cm	17
8	Chisel cold flat 6 mm	17
SHOP OUT FIT		
9	Calipers outside 20 cm	8
10	Calipers inside 20 cm	8
11	File flat rough 35 cm double cut	8
12	File square rough 25 cm	8
13	Hardle or bottom sit for anvil 5 cm	4
14	Tong bolt 300,500,1000,1500 mm	6 each
15	Tong side -do-	"
16	Tong flat -do-	"
17	Tong round -do-	"
18	Tong hollow bit -do-	"
19	Centre punch 10 cm	2
20	Punch round 18 to 36 mm x 6mm raising by 6 mm	2 sets
21	Punch round 6 to 15 mm x 2 mm raising by 3 mm	"

SI No	Item	Qty
26	Case hardening box 38 x 38 x 1.25 cm M S plate	1
27	Engineers Try square 15 cm	4
28	Annealing box 152 x 50 x 45 cm MS 3 mm thick	1
29	Bench vices 15 cm jaw	4
30	Steel tape 3 meters	4
31	Tinmans square 45 cm x 60 cm	4
32	Standard sheet metal gauge	1
33	Funnel	4
34	Brush steel wire 5 cm x 15 cm No.1	4
35	Bench vice 12 cm jaw	4
36	Brush Flat wall 50 mm	4
37	Brush Flat 25 mm	8
38	Scrapper 1" or 2"	Each 2
39	Knife chisel	4
40	Wire brush	6
41	Dust brush	2
42	Velocity cap	1
43	Whiping materials (White Kerosene / methylene)	5 litres
44	Brush holder	1
45	Blow lamp	1
46	Mashing tape	1
47	Drop sheet	1

22	Hammer smith 1.8 Kg handled	4
23	Hammer ball pen 0.9 kg handled	4
24	Steel rule 30 cm	8
25	Hacksaw frame adjustable 30 cm	4

48	Paint mixer	1
49	Mashing paper	1 roll
50	Elco meter	1
51	Glassometer	1

SI No	Item	Qty
GENERAL INSTALLATION		
52	Muffle furnace	1
53	Magnetic particle Testing machine	1
54	Spray Gun gravity or pressure feed container and Gun 20 litres capacity	1
55	Shearing machine for cutting flat, square round bars and plates hand operated	1
56	Polishing & buffing machine with rough, medium & fine buffers	1
57	Powder coating equipment complete with drying oven	1
58	Phosphating plant	1
59	Portable sand / shot blasting equipment with blasting materials	1

SI No	Item	Qty
60	Water tank for quenching capacity about 300 litres.	1
61	Brinell hardness Testing machine	1
62	Universal Testing machine	1
63	Rockwell hardness testing machine with ABC scale lead 60, 100 and 150 Kgs.	1
64	Alloy steel test pieces of known composition of atleast 15 different steel sizes	1
65	Impact Testing machine	1
66	Dye penetrant kit	2
67	Chart for spark test	1

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting &Welding)

BROAD BASED BASIC TRAINING

(One Year)

MODULE - VI : BASIC ELECTRICAL , ELECTRONICS & COMPUTER SKILLS

(Duration - **8 weeks**)

MODULE - VI : BASIC ELECTRICAL , ELECTRONICS & COMPUTER SKILLS

(Duration - 8 weeks)

I) COURSE CONTENT

a) Electrical, Electronics - 4 weeks

b) Computer skills - 4 weeks

WEEK No.	Practical	Theory
1	<ul style="list-style-type: none"> - Demonstration of use of Safety equipments and artificial respiration. - Use of hand tools. Joining 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 Aluminium conductor, cable joints. Use of Aluminium flux and Alca 'P' solder. Demonstration and practice of crimping of various wires 	<ul style="list-style-type: none"> - Importance of Safety- Description, specification, general care & maintenance of common hand tools - Wires & cables - conductors, Insulators & semiconductors - their shapes, sizes with respect to low, medium & high voltage - Soldering Printed circuit boards & its uses - Different fluxes for different purposes on metals- Crimping equipment - Joining of conductors by soldering - Importance of Preventive Maintenance and routine tests - Earthing and its importance.
2	<ul style="list-style-type: none"> - 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 & Practice on connecting & replacement of common electrical accessories in circuits – Use of tong tester and megger.. 	<ul style="list-style-type: none"> - Resistance, Voltage, Current, open circuit and short circuits- Ohm's law - Voltage drop - series & parallel circuits - Power & energy relations - Electrical measuring Instruments – Multi-meters - Common electrical accessories used in Industries - Bus-bars, Relays, Contactors, Circuit Breakers, etc.. - Fuses and its ratings – materials used
3	<ul style="list-style-type: none"> - Simple wiring practice with distribution boards, Junction Boxes, Main Switches two way and intermediate Switches. 	<ul style="list-style-type: none"> - Induction principles - Electro-magnetism - Faraday's Laws - Single phase & Poly phase system 3 phase star-delta

	<ul style="list-style-type: none"> - 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 . 	<p>connections, Impedance & power factor –</p> <ul style="list-style-type: none"> - Principles & Applications of DC Motors , Series, Shunt & compound motor – AC Motors - Transformers & its applications - Chemical effect of electric current - Rechargeable batteries - Care & maintenance of cells - AC Motor starting with DOL Starter and Star - Delta Starter
4	<ul style="list-style-type: none"> - 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 ICs etc. - Demonstration on Rectifiers - Identification of ICs 	<ul style="list-style-type: none"> - Static Electricity - Capacitors & its applications - Fundamentals of a electron theory - semiconductor devices - Symbols - specifications - Diodes, Transistors, Uni-junction Transistor, Field effect Transistor Silicon Controlled Rectifier & ICs. - Half wave, full wave & Bridge rectifier with filters, DC Power supply
5	<ul style="list-style-type: none"> - Booting The Computer , Opening Windows Menus, using the mouse, refresh computer desktop using right click of the mouse, create a directory in xp and 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 display, change the volume name of the hard disks using system properties., Familiarise with Keyboard and Keys. 	<ul style="list-style-type: none"> - Introduction To Computer Fundamentals And Its Parts, Familiarising With Disk Drives, Booting Of A Computer System, Using The Mouse, Right Click, Left Click And Use Of Operating Systems Like 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	<ul style="list-style-type: none"> - Techniques of Changing desktop wall paper, changing Desktop Screen properties, Control Panel , User Accounts, customizing icons, 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 hardware to the system (like a Printer, Change the system date and Time, changing the Regional Settings of the system like country, Currency , Date Format , Using Start Menu, Creating Desktop Short Cuts 	<ul style="list-style-type: none"> - Use of desktop , control panel settings, Explorer, regional settings, creating shortcuts, Use of Simple applications like Paint, Notepad,

7	<ul style="list-style-type: none"> - 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 e-mail account, setup server authentication settings, receive and send emails from the account. Search using Yahoo and Google for certain topics, download a file from the internet, save the downloaded file. Set up the netmeeting using MSN or Yahoo Messenger. 	<ul style="list-style-type: none"> - Study of Internet Explorer, Modem, Settings in the IE and Modem, Dial Up and Broadband connections, Outlook Express, Viewing Email from the web site and Outlook Express, Creating email Accounts, using search engines, Video conferencing, MS Chat
8	<ul style="list-style-type: none"> - 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, set hanging indents, draw a simple table, insert rows, insert columns, erase rows, erase columns, search the document for spelling corrections, print the letter 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 - Copy the sheet into sheet 2. Sort the sheet 1 as per names. Sort the sheet 2 as per Total salary - Insert two rows in sheet1. Merge these rows. Enter heading as Salary Bill. Use border and shading for the entire used column - Print the sheet using set print area with margins, and use scale factor for reduction and enlargement. Use portrait and Landscape. 	<ul style="list-style-type: none"> - Creating sample documents using MS WORD. Text wrapping, Text Formatting, Changing Letters to different case, drawing table, Mail Merging, Page formatting, Using different Font Types, Printing a document - Using Excel as spread Sheet, Familiarising with Cells, Formulae, Text, Numbers, and date, Using shortcuts for entering date and Numbers in Progressive cells, Copying Formulae, Text and Numbers, Using borders, 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

I) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

SI No	Item	Qty
Tools, Instruments General Shop Out fits and measuring instruments		
1	Combination Pliers 200mm insulated	17Nos
2	Screw Driver 100mm200mm	17Nos each
3	Neon Tester 500V Pencil bit type	17Nos
4	Electrician Knife	17Nos
5	Hammer ball pein 0.25 kg	17Nos
6	File round 150mm	17Nos
7	Pliers side cutting 200mm	4Nos
8	Pliers round nose 200mm	4Nos
9	Pliers flat nose 150mm	4Nos
10	Pliers long nose 200mm	4Nos
11	Firmer chisel 25mm	4Nos
12	Hammer ball pein 1.0kg	1No.
13	Wall jumper octagonal 37mmX 450mm	1No.
14	Center punch 100mm	1No.
15	Steel measuring tape 20mts	1No.
16	Allen Keys	1Set
17	Spanner double ended set of 6	2 Sets
18	Adjustable spanner	1No.
19	Steel rule 300mm	4Nos.

SI No	Item	Qty
20	Electric soldering iron 35W	4Nos.
21	Electric soldering iron 125W	2Nos.
22	Rubber gloves 5000V	2pairs
23	Multimeter 0-5,100,200,500 mill amperes 0-100-1000,10000 ohms 0-150,300,600V AC/DC	2Nos
24	Bar magnet	1No.
25	Horse shoe magnet	1No.
26	Electric Drill Machine 6mm capacity universal type 250 V	1No.
27	D.C. shunt motor 1 H.P. 250V (Laboratory type)	2No.
28	Universal motor 750W AC/DC 250V	2No.
29	Squirrel cage induction motor 1 H.P,230V with DOL starter	1No.
30	Transformer single phase 500 ma./ 250 /12V	4Nos.
31	L.F oscilloscope with Attenuation probes	1No.
32	Star Delta starter (contact type 8 points)	1No.
33	Tong Tester	1 No.
34	Meggar	1 No;
35	DC Power Supply 0v – 110 v / 5A	1 No.
36	Auto – transformer – variac 230 v	1 No.
37	Tweezers	16 Nos.
38	Crimping tools	1 set

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GENERAL INSTALLATION

SI No	Item	Qty
39	PENTIUM IV COMPUTER or latest WITH 512 MB RAM WITH FOLLOWING ACCESSORIES - DVD COMBO DRIVE WITH THE LATEST X VERSION, HARD DISK WITH 80 GB OR ABOVE, 17" MONITOR , AGP GRAPHICS CARD WITH 64 MB, 10/100 ETHERNET CARD, MODEM	9 NO
40	CENTRALISED UPS WITH 5KVA CAPACITY	1 NO
41	LASER PRINTER	1 NO
42	DOT MATRIX PRINTER	1 NO
43	WINDOWS XP OPERATING SYSTEM	09 NO
44	MS – OFFICE 2000	09 NO

Workshop furniture		Qty
1	Suitable Work Tables with vices	As required.
2	Stools	17 Nos
3	Discussion Table	1 No
4	Tool Cabinet	2 Nos
5	Trainees locker	2 Nos
6	Fire fighting equipment, first aid box etc	As required
7	Book shelf (glass panel)	1 No.
8	Storage Rack	As required
9	Storage shelf	As required

UPGRADATION OF ITIs into CENTERS of EXCELLENCE (CoE)

SECTOR / AREA : FABRICATION (Fitting & Welding)

BROAD BASED BASIC TRAINING

(One Year)

COMMON MODULE : ENGINEERING DRAWING - 2 hours / week - 48 weeks

AND

WORKSHOP CALCULATION

& SCIENCE - 2 hours / week - 48 weeks

BROAD BASED BASIC TRAINING

(One year)

COMMON MODULE : ENGINEERING DRAWING - 2 hours / week - 48 weeks
 AND
 WORKSHOP CALCULATION & SCIENCE - 2 hours / week - 48 weeks

I) COURSE CONTENT

Week No.	Engineering Drawing	Workshop Calculation & Science
1 & 2	- Familiarisation with the Institute	- Familiarisation with the Institute
3	- Introduction to Engineering Drawing and its importance. Different types of standards used in engineering drawing.	- Units & Measurements – Systems of units, Fundamentals and derived units
4	- Drawing instruments & their uses-Drawing board, 'T' square, set squares, protractor, Drawing sheets, Drawing Pencils - Grade and selection, eraser. - Practice : Layout of drawing sheet	- Conversion of units and applied problems. - FPS, CGS, MKS and SI units
5	- Types of lines – Thickness, shade of lines and its General applications. - Practice: - Draw type of lines as per IS-70714 – 1983 - Draw figures involving horizontal, vertical and inclined lines	- Fraction & decimals – Addition, Subtraction, multiplication and division
6	- Type of Angle, Triangles and their types.	- Fraction & decimals - Addition, Subtraction, multiplication & division

7	- Practical : Construct Scalene triangles, right angle triangles, Isosceles triangles and equilateral triangles	- Mass weight, volume and Density and their units.
8	- Lettering styles- Single stroke letters, Gothic letters as per IS standard. - Practice : Lettering practice	- Problems on density and volume of Steel, Aluminum and copper.
9	- Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement and indication of dimensions.	- Simplification of Fraction and Decimals
10	- Practice : Place dimensions in the drawing by aligned system and unidirectional system - Give dimension to the given drawing by following dimensioning principles as per BIS	- Simplification of Fraction and Decimals
11	- Method of dimension common features	- Definition -Force, Pressure, and their units
12	- Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic.	- Definition- Stress, Strain and Modulus of Elasticity
13	- Practice : Construct square, rectangle, parallelogram, rhombus, trapezium and quadrilateral	- Square & Square roots
14	- Practice : Draw a regular pentagon by circum scribing & inscribing	- Plotting and reading of simple graph.
15	- Practice : Draw a regular hexagon by arc method	- Heat, Temperature and conversion of scales Fahrenheit, Centigrade, and Kelvin.

16	- Practice : Draw a regular pentagon, octagon and various types of tapers	- Thermometer, Thermocouple and Pyrometer and its application
17	- Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse. - Practice : Prepare proportionate free hand sketches of plane figures	- Transmission of heat and co-efficient of Thermal expansion of solid and related problems.
18	- Practice : Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand	- Ratio and proportion
19	- Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing.	- Ratio proportion – Direct – Indirect and mixed proportions
20	- Practice : Draw a plan, elevation and side view of prism and cylinder	- Simple machines – Mechanical advantage, velocity ratio and efficiency
21	- Practice : Draw a plan, elevation and side view of cone and pyramids	- Simple problems on simple machines
22	- Practice : Draw a plan, elevation and side view of frustum of cone and pyramids	- Mensuration – area of circle, triangle and polygons
23	- Practice : Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements.	- Mensuration – Surface area, Volume of cube and Sphere
24	- Practice : Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved	- Mensuration – Surface area and volume of Cone and prism

	surfaces – simple machine elements.	
25	- Practice : Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements.	- Mensuration – Surface area and volume of Cylinder and Hollow cylinder
26	- Practice : Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements.	- Use of Logarithm and anti logarithm tables
27	- Practice : Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements.	- Multiplication and Division – use logarithms
28	- Drawing Isometric views out of orthographic views- Simple Machine Elements	- Simplification of Fraction and decimals – use logarithms
29	- Practice : Construct an isometric scales to a given length	- Friction, kinds of friction - Advantage & disadvantage
30	- Practice : Draw the isometric projection of cube, hexagonal prism	- Percentage problems – Metal removal by machining
31	- Practice : Draw the isometric projection of a cylinder and cone	- Percentage problems – Metal added by welding
32	- Practice : Draw the isometric view of the objects/blocks with curved surfaces	- Estimation and cost of finished products.
33	- Practice : Draw the isometric view of the objects / blocks with curved	- Classification of Ferrous and Non -Ferrous Metals and Alloys.

	surfaces	
34	- Missing lines and views.	- Physical and mechanical properties of metal
35	- Practice : Visualize the shape of the object from the given two views and add the third views – simple machine elements	- Simple algebraic addition and subtraction
36	- Practice : Identify the lines missed in multi views and supply them - Identify atleast five shapes satisfying a given view - Identify the third view for the given two views of similar in shapes and size.	- Simple algebraic multiplication and division
37	- Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones.	- Algebraic - Simplification problem
38	- Practice : Draw the development of surfaces of a cube and prism	- Algebraic – Simultaneous Equation
39	- Practice : Draw the development of surfaces of a cylinder and cones	- Meaning of H P, IHP, BHP and FHP
40	- Explanations of full – sectional view, half-sectional view , aligned sections.	- Efficiency, problems on Horse Power
41	- Practice : Draw full and half sectional view of simple machine elements	- Trigonometrical Ratios and simple formulae
42	Conventions and symbols used in drawing, Abbreviations used in engineering drawing, surface finish symbols, Welding symbols and Annotations.	- Calculate the area of triangle by using trigonometry, Application of Pythagoras theorem.
43	- Practice : Draw surface finish symbols, Welding symbols & Annotations.	- Calculate height and distance by using trigonometry

Week No.	Engineering Drawing	Workshop Calculation & Science
44	- Classification of engineering Drawings, Difference between Assembly drawing and Working drawing.	- Heat treatment – process of Annealing, Normalizing, Hardening, and tempering
45	- Blue print reading of various Engineering drawing and Machine drawing.	- Case - Hardening process - Carburizing and Nitriding - application and uses.
46	- Practice : Blue print reading of Engineering Drawings and Machine drawing.	- Basic principles of electricity. Ohms law – series and parallel circuits.
47	- Introduction to free hand sketching of machine parts. Tracing and printing of drawing. Introduction to Auto CAD, 3D modeling concept.	- Uses of switch, Fuse, Conductor, Insulator and Semi-conductor
48	- Practice : Draw the elevation , plan and the side view of bench vice and lathe tail stock	- Magnetism – Natural & Artificial and application.

II) TOOLS, MACHINERY, EQUIPMENTS etc. for a batch of 16 trainees

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|---|---|--------|--|
| 1. Drawing Board – 700 x 1000 mm with Table | - | 17 Nos | |
| 2. Drawing Instrument Box | - | 17Nos | |
| 3. Mini Draft equipment | - | 17 Nos | |
| 4. Computer - Latest configuration with 17" color monitor | - | 2 Nos | |
| 5. UPS – 800 VA / 540 W | - | 2 Nos | |
| 6. CAD Software – Latest version | - | 2 Nos | (For Demonstration of Orthographic projection, Isometric projection, Sectional views, Missing lines and views) |