

**Syllabus for the trade
of**

INDUSTRIAL PAINTER

(SEMESTER PATTERN)

**UNDER
CRAFTSMAN TRAINING SCHEME**

Designed in: 2013

By

Government of India
Central Staff Training and Research Institute
Directorate General of Employment & Training
Ministry of Labour & Employment
EN -81, Sector-V, Salt Lake City,
Kolkata-700091

List of the Members of Trade Committee Meeting for the trade of
“INDUSTRIAL PAINTER” held on 14th & 15th December 2010 at A.T.I , Mumbai.

Sl. No.	Name and Designation S/Shri	Organization	Remarks
1.	R.K. Singh, AGM	TATA Motors Ltd, Chikali, Pune	Chairman
2.	R.K. Pathak, JDT/HOD	ATI, Mumbai	Member
3.	Anil Kumar, JDT/HOD	CSTARI , Kolkatta	Member
4.	D.K. Pawagi, JDT/HOD	RDAT, Mumbai	Member
5.	Shephali Halbe, Sr. Manager	SAI Service, Mumbai	Member
6.	Shailesh Bharsai, Sr. GM	Sai Service, Mumbai	Member
7.	R.K. Yadav, QA Mngr.(Paint)	M&M, Mumbai	Member
8.	S.B. Sawant, Manager Paintshop	MVML, Chakan	Member
9.	Mrs. R.D. Diwan, Lecturer	VPM Polytechnic, Thane	Member
10.	S.D. Paranjpe, Consultant	Asian Paints, Mumbai	Member
11.	S.M. Sadamate, Asstt.App. Advisor	BTRI, Mulund	Member
12.	P.S. Wagh, Principal	ITI, Mulund	Member
13.	N.V. Atale, Manager field service	Mercedes-Benz India, Pune	Member
14.	R.S. Shinde, Manager Paint shop	Badve Engg. Ltd., Aurangabad	Member
15.	M.M. More, Principal	ITI, Manikdor, Pune	Member
16.	D.B. Dangat, Manager Powder coating	Godrej & Boyce, Mumbai	Member
17.	S.S. Majumdar, Ex-Principal,	VPM Thane	Member
18.	Dr. Anagha S. Sabnis, Asstt. Prof.	Inst. Of Chemical Tech, Mumbai.	Member
19.	R.B. Patki, Instructor	ITI, Parbhani	Member
20.	S.B. Bagwe, Sr. Mngr.	Mahindra Vehicle Mfg.Ltd., Nighoje, Pune	Member
21.	R.B. Pardhe, Instructor	ITI, Manikdor, Pune	Member
22.	S.S. Panchal, Instructor	ITI, Ambarnath	Member
23.	Manoj Somani, Manager Technical	Kansai Nerolac Paint, Mumbai.	Member
24.	Subodh Mukherjee, Officer-Technical	Kansai Nerolac Paint, Mumbai.	Member
25.	R.S. Ghume, Principal	ITI, Aundh, Pune	Member
26.	J.D. Kurkute, Asstt. Manager Training	TATA Motors Ltd., Pune	Member
27.	Hemant Iswalkar, Exe. Tech.	Asian Paints Ltd., Mumbai	Member
28.	S.R. Thate, Instructor	ITI, Aundh, Pune	Member
29.	C.H. Ravi, DDT	ATI, Mumbai	Member
30.	S.G. Raigonde, DDT	ATI, Mumbai	Member
31.	P.K. Roy, DDT	ATI, Mumbai	Member
32.	ARH Shaikh, TO	ATI, Mumbai	Member
33.	R.S. Wagh, VI	ATI, Mumbai	Member
34.	L.K.Mukherjee, Deputy Director	CSTARI, Kolkata	Member

List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6th to 10th May'2013 at CSTARI, Kolkata.

Sl. No.	Name & Designation	Organisation	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
2.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
3.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
4.	L.K. Mukherjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
5.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
6.	N. Nath, Assistant Director of Training	CSTARI, Kolkata-91	Member
7.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
8.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
9.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
10.	Goutam Das Modak, Assistant Director of Trg./Principal	RVTI, Kolkata-91	Member
11.	Venketesh. Ch. , Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
12.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
13.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
14.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
15.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
16.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member
17.	Suriya Kumari .K , Training Officer	RVTI, Kolkata-91	Member
18.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
19.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
20.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
21.	Sunil M.K. Training Officer	ATI, Kolkata	Member
22.	Devender, Training Officer	ATI, Kolkata	Member
23.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
24.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
25.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
26.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
27.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
28.	Nilotpall Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
29.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

GENERAL INFORMATION

1. Name of the Trade : **INDUSTRIAL PAINTER**
2. NCO Code No. :
3. Duration : 1 year (Two Semesters)
4. Power Norms : 2.5 Kw
5. Space Norms : 4.00 Sq Meter / Trainee
6. Entry qualification : Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
7. Unit Size (No. of Trainees) : 20
8. Instructor's/ Trainer's Qualification : a) Tenth Class Passed + NTC + NAC in paint technology.
: b) Preference will be given to a candidate With Craft Instructor Certificate

Note : At Least One Instructor must have Degree/Diploma in Paint Technology

**Syllabus for the Trade of
“INDUSTRIAL PAINTER” under C .T.S.**

FIRST SEMESTER

(Semester Code No. IMP-01)

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
01 to 02	<p>Introduction to training Industrial discipline and working environment. Familiarization with shop layout, Introduction to safety - including fire equipments and their uses. Familiarize with Carpentry and Fitter’s hand tools.</p> <p>Physical introduction to measuring handling of instruments such as Steel rule of different ranges.</p> <p>Filing a flat surface of mild steel and cast iron. Check for flatness, straightness and squareness. Mark out according to simple blue print.</p>	<p>Importance of safety and general precaution observed in the institute.</p> <p>Introduction to 5-S and TPM system. Preliminary information about Kaizen.</p> <p>Environmental factors and pollution. Personal safety and health hazards.</p> <p>Introduction to metals and non metals and their properties.</p> <p>Introduction to different tools and equipment used for fitting jobs.</p>	<p>Freehand sketching of straight line, rectangles, squares, circles, polygons etc</p>	<p>Applied workshop problem involving multiplication & division common fractions, addition, subtraction, multiplication and division.</p>
03 to 04	<p>Hack sawing –marking, sawing and chiseling the edges straight and square to the surface</p> <p>Filing flat and square surfaces. Marking and punching of stepped and angular components and finishing. Measurement of flat rectangular objects, cylindrical objects, hollow components. Drilling practice and maintenance</p>	<p>Marking and punching tools and their uses. Hacksaw and their application Chisel-types and their uses. Units of measurements – Physical quantities.</p> <p>Broad classification of files and its application.</p> <p>Bench vice and its working</p> <p>Hand Drilling machine and its operation</p> <p>Standard size of threads, - types, care</p>	<p>Free hand writing of letters and numbers</p>	<p>Common properties and uses of cast iron, wrought iron, plain carbon steel, high speed steel and alloy steel.</p>

05 to 06	<p>Marking out for carpentry work.</p> <p>Use of carpenter's basic hand tools for simple operation viz. sawing, planing, drilling etc. Sharpening of tools.</p>	<p>Types of woods, their description and use. common defects in timber and their effects. Introduction to tools used in carpentry work. Safety precaution, description, uses and care of hand tools. Grinding of tools and precaution to be taken.</p>	<p>Free hand sketching of nuts and bolts with dimensions from sample.</p>	<p>Introduction to metals and non metals and their properties. Manufacturing process of pig iron and cast iron.</p>
07 to 08	<p>Making simple carpentry joints, used in doors, windows, timber floors, panels, wooden partition, etc.</p> <p>Use of jointing devices nails, screws, nuts, bolts and dowels joints by wooden fittings with glue.</p> <p>To prepare the surface of wood by varnishing, polishing and touch wood.</p> <p>Finishing of surface of wood</p>	<p>Common joints their description and use. Use of nails, screw, hinges, dowels, etc. Glue's specification, preparation of compounding and their application. Use of planer different types and their functions.</p>	<p>Introduction of simple orthographic projection use of different types of lines and symbols for drawings.</p>	<p>Ratio and proportion. Simple algebra-algebraic symbols, addition, subtraction, multiplication and division of expressions involving algebraic symbols.</p>
09 to 10	<p>Importance of skills involved. Handling of tool and equipments used in sheet metal work. Familiarization with machinery and equipments and their layout in the section. Use of protective safety devices on shop floor. Practice in scribing of straight line. Bisection of straight line with marking tools practice in marking simple geometrical shapes. Practice in cutting sheet metal to different shapes using various types of snips. Folding/bending sheet metal to 90° using wooden mallet.</p>	<p>Introduction to trade. Safety precautions to be observed in the workshop. Importance of sheet metal work and welding in industry. Sheet metal-Classification and their uses. Measuring and Marking tools- Try square, dividers, trammels, marking block, Scriber, Steel rules, Calipers, SWG, etc. Types of Snips, shears and their uses. Sheet metal work Tools-Mallet, Nylon Hammers, Bench vice, C Clamps, Pliers.</p>	<p>Use of different types of lines and symbols for drawings. Simple isometric drawings isometric views of simple objects such as square, rectangles, cubes etc.</p>	<p>Standard algebraic formula. Simple equations and simultaneous equations with two unknown quantities.</p>

11 to 13	<p>Jointing of simple sheet metals of different gauges by simple self secured joints. Joining sheet metal by soft soldering and brazing. Practice in making articles such as cone, cylinders etc.</p> <p>Flanging sheet metal to 90° To make 90° L piece of equal diameter and join them at right angle</p> <p>Making holes in sheet metal using power operated hand drilling machine</p> <p>Practice on pipe bending.</p> <p>Riveting practice using various types of rivet heads. Making Riveted joints</p> <p>Practice on removing dents of spherical and hemi-spherical articles</p>	<p>Different types and uses of joints employed in sheet metal work. Brief description of brazing and soldering.</p> <p>Cutting methods- straight cutting-circle cutting- Louver cutting, Nibbling, slot cutting, Notching</p> <p>Sheet metal works - Folding, Bending & Flanging</p> <p>Brief description and use of hand punching machine</p> <p>Description of power operated and drilling machine, drill bits, etc.</p> <p>Method of laying out pattern</p> <p>Bending of pipes</p> <p>Introduction to tube and pipe.</p>	Use of different types of scales in inches and mm. Freehand isometric sketching of simple objects with dimensions.	Heat and temperature. Name and use of temperature measuring instruments normally used in workshops. Thermometric scale and conversion of Centigrade and Fahrenheit scales.
14 to 15	<p>Introduction to welding workshop and welding methods.</p> <p>Welding methods Gas welding, brazing, soldering. Resistance welding- (a) seam welding (b) spot welding and (c) butt welding MIG welding –(CO₂ welding) <u>Material:</u> Thin material- M.S., Galvanized Steel and S.S. welding defects, causes and remedies.</p>	<p>Introduction to welding process. Gas cylinders, pressure regulator, hose pipe, welding torch and safety precautions.</p> <p>Introduction to resistance welding – equipments and accessories and types. Advantages, disadvantages and application.</p> <p>Introduction to MIG welding – equipments and accessories and types of inert gases. Advantages, disadvantages and application.</p> <p>Types of defects- internal, external.</p>	Free hand sketching of plan and elevation of simple objects like hexagonal bar, square bar, circular bar, tapered bar, hollow bar etc	Determination of area and volume of simple solid bodies.
16 to 18	Basic computer & graphic skills Word Processing Introduction to Word Processing Editing a	Familiarization with computer and its accessories.	Free hand sketching of simple objects	Trigonometry; Trigonometric functions and

	<p>Document Move and Copy Text and Help System Formatting Text and Paragraph Finding and replacing Text and Spell Checking</p> <ul style="list-style-type: none"> Using Tabs Enhancing Document Columns, Tables and Other Features Using Graphics, Templates and Wizards Using Mail Merge Miscellaneous features of Word <p>Spread Sheet Introduction to Spreadsheet Creating Worksheets & feeding data Using functions Editing Cells and Using commands and functions Opening, Saving and Printing a Worksheet Working with Charts Presentation Creating presentations using AutoContent Wizard, Template & Blank presentation Working with Master's Slide, Title handout and Notes</p> <ul style="list-style-type: none"> Viewing a Presentation <p>Coordinate Systems</p> <ul style="list-style-type: none"> 2-D coordinated system 3-D coordinated system <p>Concept of</p> <ul style="list-style-type: none"> Polygon and Mesh Perspective Projection <p>Concept of Multimedia Methodology & Process of Multimedia Project Management</p> <p><u>Graphics Editing</u> Traditional Design Traditional and digital applications of color, concept and composition.</p>	<p>Introduction to Computing Introduction to Computers Classification of computers based on size, purpose and operation Input and output devices Block diagram of CPU Operating system software Utility Software Safety and occupational health: Cramped room and ill-light working environment damage the eye sight and develop stress symptoms. Proper sitting posture. Proper lifting of posture of heavy monitor, computer, printer and other office machineries may cause back pain. When direct physical telephone line is used for internet connection make sure it is being detached whenever there is thundering. Environment: Pollution of environment due to e-waste like junk key board, components of computer and other office machineries Waste recovery facility through inter industry exchange. Tools to be Used : MS Office <u>MS Office</u> Preparation of a document using</p>	<p>related to the trade and preparation of simple working drawings from the sketches. Free hand sketching of different forms of threads.</p> <p>Drawing simple diagram using signs and symbols using colour representation</p> <p>Free hand sketching of helical bevel and gear</p>	<p>tables. Trigonometric identities. Practice in calculations involving area and volume of wood and workout total cost on the basis on given rates.</p>
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	<p>Drawing 1</p> <p>Drawing 2</p> <p>Color Theory Principles and techniques for the perception and effective use of color in all media. Includes work with values, neutrals, basic color schemes.</p> <p>Painting Materials and techniques of painting. Subject matter includes still life, landscape and figurative studies. Emphasis is on individual development and response to the media.</p> <p>Illustration Techniques An introduction to various illustrational styles, techniques and media used in the creation of pictorial illustration as applied to commercial art.</p> <p><u>Graphics Editing Techniques</u> Introduction</p> <p>Creating Graphics Editing Tool Documents</p> <p>The Graphics Editing Tool Interface</p> <p>Basic Drawing</p>	<p>different toolbar. Creating objects using drawing toolbar with shading, filling colour, grouping and placed in order. Creating artistic page border.</p> <p><u>MS Excel</u> Preparation of different charts using same data and with multiple data.</p> <p>Formatting data series, filling effects in charts. Changing orientation & style of data labels and values of chart.</p> <p><u>MS Power Point</u> Preparation of a presentation containing own profile Tools to be Used : Adobe Illustrator</p> <p>Drawing 1 Fundamental techniques of drawing in pencil, charcoal, and ink. Emphasis is on realistic representation and visual observation.</p> <p>Drawing 2 Advanced concepts of drawing. Emphasis is on design and composition and experimental techniques in different media.</p>		
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	<p>Working with Color</p> <p>Object Transformation and Positioning</p> <p>Use of Brushes</p> <p>Use of Symbols</p> <p>Saving and Printing</p>	<p>Color Theory</p> <p>Painting</p> <p>Still life, landscape and figurative studies.</p> <p>Illustration Techniques</p> <p>Creation of pictorial illustration as applied to commercial art.</p> <p><u>Graphics Editing Techniques</u></p> <ul style="list-style-type: none"> • Use of Graphics Editing Tool. • Knowledge about vector graphics. • Understanding paths • Fill and stroke attributes • Selections and stacking order <p>Editing Graphics</p> <ul style="list-style-type: none"> • The Welcome screen • Important document settings <ul style="list-style-type: none"> • Exploring panels and workspaces • Using the control panel • Navigating within a document • Using guides and grids • Utilizing the bounding box • Using smart guides • Choosing preview options <p>Drawing</p> <ul style="list-style-type: none"> • Using the basic shapes tools • Drawing with the Pen tool • Drawing with the 		
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		<p>Pencil tool</p> <ul style="list-style-type: none"> • Painting with the Paintbrush tool <p>Editing</p> <ul style="list-style-type: none"> • Creating compound shapes • Utilizing pathfinder functions • Using the Eraser tool • Joining and averaging paths • Outlining strokes • Simplifying paths <p>Use of Selection Tool</p> <ul style="list-style-type: none"> • Using the basic selection tools • Using the Magic Wand and the Lasso tool • Selecting objects by attribute • Saving and reusing selections <p>Appearances</p> <ul style="list-style-type: none"> • Targeting object attributes • Adding multiple attributes • Applying live effects • Expanding appearances • Creating graphic styles • Modifying graphic styles • Appearance palette settings • Copying appearance • Creating Live Paint groups • Detecting gaps in Live Paint groups • Path editing with Live Paint • Using Offset Path • Dividing an object into a grid <p>Cleaning up errant paths</p>		
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		<p>Working with Color</p> <ul style="list-style-type: none"> • Defining swatches • Creating swatch groups and libraries • Working with gradients • Working with patterns • Using the Color Guide • Experimenting with color • Finding colors with kuler • Modifying color in artwork <p>Transformation and Positioning</p> <ul style="list-style-type: none"> • Rotating and scaling objects • Reflecting and skewing objects • Using the Free Transform tool • Using the Transform panel • Aligning objects • Distributing objects <p>Using Brushes</p> <ul style="list-style-type: none"> • Creating a calligraphic brush • Creating a scatter brush <p>Creating an art brush Creating a pattern brush</p>		
19 to 22	<p>Different types of painting process Masking and its types Painting and flow diagram 1) Paint preparation. 2) Paint mixing. 3) Paint filtration. (a) brushing (b) dipping (c) tumbling (d) roller coating (e) conventional spray (f) powder coating</p>	<p><u>Importance of paint in Automotive Industry</u> Health safety and use of personal protective equipment. Occupational safety. Personal hygiene and Equipment handling. Types of abrasives, Main components of paints types of paint spray guns Application of paint. Spray booth/baking oven maintenance</p>	<p>Reading of blue print simple exercise. Free hand sketching of locking devices.</p>	<p>Further studies of metals and non metals. Properties and uses of lead, tin, zinc, brass, bronze etc.</p>

	<p><u>Liquid Spray Method</u></p> <ol style="list-style-type: none"> 1) Conventional spray painting. 2) Water based spray painting 3) Airless and Air assisted spray painting. 4) Electrostatic spray painting. <p><u>Practice of spray painting</u></p> <p>Surface preparation Primering / filler Wet sanding & denting Apply under coat & finish coat</p>	<p>Awareness of paint mixing room Introduction to new technology.</p> <p><u>Physical properties of paints</u></p> <ol style="list-style-type: none"> 1) Viscosity of paint. 2) Flash of time 3) dry film thickness 4) Spreading time 5) Drying internal 6) Curing time 7) Shade 8) Cohesion & Adhesion <p><u>Knowledge of spray gun</u></p> <p>Gun operating in parallel Distance between object Air pressure Fan pattern Types of Nozzle, condition of nozzle. Paint viscosity Paint flow rate Painting speed Synchronized painting Harmony with robo.</p>		
23	<p><u>Process for spray application for body in white</u></p> <ol style="list-style-type: none"> 1) Mechanical derusting, sanding, cleaning. 2) Pre treatment process 3) Electro deposition process 4) Sealing operation 5) Masking underbody spray, demasking 6) Dry/damp/moist/Wet sanding 7) Primer/surfacer application 8) Body preparation for painting. 9) Top coat painting. 10) Defect identification and repair 11) Waxing operation <p><u>Procedure for refinishing</u> Paint defect identification</p>	<p><u>Function of different type of fire fighting Equipment and safety precaution.</u></p> <p>Keep fire prone materials away. Wear protective clothing Ensure all electrical disconnection before painting machine.</p> <p>Types of spray guns. Suction feed gun, Gravity feed gun and pressure feed gun Introduction to process of refinishing. Dent removing, wet sanding and dry sanding</p>	Free hand sketching of pipe joint flanged joints	Preparation of simple estimation

	<p>Dent removal practice Putty application and surface preparation on dent removed area. Dry Sanding process Masking process Primer application Dry sanding Paint mixing and shade matching Touch-up/top coat painting practice Curing process Sanding, polishing, ensure the shade match.</p>	<p>Masking process Touch up process.</p>		
24	<p><u>Demonstrate Factors affecting paint application techniques.</u> Viscosity of paint. Air and paint temperature. Humidity. Thinner. Type of paint. Skill of painter for novelty finishing.</p> <p><u>Factors affecting at paint application</u> Viscosity of paint Air and paint pressure Temperature / humidity Paint resistivity Spray painting on motor cycles and car body finishing Pretreatment process primer, surfacer, stoving, wet sanding, synthetic finishing, cellulose finishing, acrylic finishes. (Thermo-Setting) finishing Sheet metal Components etc.</p>	<p><u>Description about indirect painting method</u> <u>Introduction to viscosity, temperature, humidity</u> <u>Introduction to thinner and its application.</u> Spray painting and electrostatic spray painting etc. General idea of ISI specification on paints.</p> <p><u>Knowledge of Paint parameters</u> Pressure at spray gun tip Flow rate of spraying material Spray booth temperature & humidity Viscosity of paint Oven temperature (150.c@ 30 minute's) Knowledge in estimating the cost and method of evaluating the job. Method of estimating the cost of labour, materials costing procedure for painting of work schedules.</p>	-do-	-do-
25	Project work / Industrial Visit (Optional)			
26	Examination			

**Syllabus for the Trade of
“INDUSTRIAL PAINTER” under C .T.S.**

SECOND SEMESTER

(Semester Code No. IMP -02)

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation and Science
01	<u>Electrostatic spray painting</u> Charging of paints with HV function (HV system) Handling of electromagnetic generators, safety devices in electrostatic spraying, application of electrostatic spraying, Handling of paint for electrostatic spraying.	<u>Safety parameters in H.V. system</u> Di, Dt. tripping. Over current tripping. The basic principle of H.V. painting is attraction of + ve and - ve charged ions.	Free hand sketching of small parts related to the trade	Estimation of labour charges for painting jobs
02	<u>Electrostatic painting</u> Electrostatic hand guns. Electro air gun Ransburg electro-hydraulic gun. Practice on Electrostatic blade coater. High tension supplies for Electrostatic spraying.	<u>Electro coating</u> <ul style="list-style-type: none"> • Wrap round effect. • Pneumatic system. • Paint feed system. • H.V. system. • Paint spray system. 	Free hand sketching of small parts related to the trade	Estimation of labour charges for painting jobs
03	<u>Powder coating methods.</u> 1) Fluidized bed process (Dip). 2) Electrostatic fluidized bed process. 3) Electrostatic powder spray. 4) Disc application methods. 5) Flocking Electrostatic disc. 6) Tunnel coater, plazma spray.	<u>Powder Coating.</u> The new Technology of powder spraying. Type of powders and its properties. Epoxy, Hybrid, Polyester Tgec polyester urethane, Acrylic urethane.		-do-
04	<u>Application techniques of powder paint.</u> Surface preparation for powder coating. Powder baking oven and temperature. Practice powder coating.	<u>Powder Coating.</u> Economic benefits Environmental benefits of powder coating.	Free hand sketching of small parts related to the trade	-do-
05	<u>Common Application problem in painting.</u> SAGGING / RUN DOWN Downward movement of the paint.	<u>Defect free painting success of painting.</u> Causes of paint defects. Defective paint Poor tools &	Free hand sketching of small parts related to the trade	-do-

	<p>The excess paint rundown and gives an uneven surface. BURSH MARK'S Paint is applied with a brush. Bristle mark's appear, varnish left by the brush.</p>	<p>equipment's Poor surface preparation CAUSES Improperly flatting operation. High viscosity Poor workmanship REMEDIES Proper viscosity. Distance between object Use good quality bristled brush..</p>		
06	<p>WRINKLING Paint wrinkles and together when thick coat of paint is applied. Pronounced with enamels and varnishes. FADDING/SPOTING Total discolouration & lose of gloss known as fadding.</p>	<p>CAUSES Poor paint property. Thick coating apply. REMEDIES Proper surface preparation. Good adhesive property of paint. CAUSES Improper paint formulation. Pigment unmixed. Incompatible pigment used. REMEDIES Good quality paint. Well mixing of paint. Good surface preparation.</p>	Development of surfaces of simple objects	Example on simply supported load beams
07	<p>PEELING Rapture of paint film being removed on a skin. Applicator paint is unattached. CHALKING Substance appears on the painted surface. A phenomenon manifested in paint film. White patch on the surface.</p>	<p>CAUSES Interference between two coats. Poor quality of paint. Applied on wet condition. REMEDIES Approved paint quality. Good surface preparation. Proper mixing of paint. CAUSES Unsuitable pigment. Improperly mixing of paint.</p>	-do-	-do-

		<u>REMEDIES</u> Approved quality paint. Proper mixing of paint. Stored at dust free atmosphere.		
08	<u>CISSING</u> Substance appears on the painted surface. Surface is an oily. <u>BLISTERING</u> There are patch on the surface. Surface thickness very high.	<u>CAUSES</u> Contamination of the surface by oil, Grease, water. Compressed air contamination. Oil in compressed air. <u>REMEDIES</u> Surface to be painted are cleaned. Check air quality. Compressed air free from oil, water etc. <u>CAUSES</u> Surface contamination. High film thickness. Improper solvent balance. <u>REMEDIES</u> Surface to be painted are Cleaned. Adjust D.F.T. Check conveyor.	-do-	-do-
09	<u>D.F.T. (DRY FILM TESTING)</u> Adhesion & flexibility test. scratch resistance tests Hardness test. Gloss test	Adhesive and 17flexibility Nature of dried film is tested. Scratch resistance to test the dry film to with stand a given load without producing scratch. Hardness test Find out what load scratch is produced on the dried paint film. Gloss test. To measure the gloss of paint by reflection of 45 degree angle of incidence.	Construction of simple curves of inter penetration	Plotting of graphs of simple equations, reading of graphs

10	<p><u>W.F.T. WET FILM TESTING)</u></p> <p>Viscosity test/consistency test.</p> <p>Colour chart test.</p> <p>Pigment content test.</p>	<p>Viscosity test To measure the flow characteristic of paint. The time required to drain a standard quantity of paint through a standard orifice.</p> <p>Colour chart test to find the colour shade of paint. Pigment content test. Sprayed on 150x150mm MS plate in two normal coats.</p>	-do-	<p>Properties of fluids. Introduction to surface tension and viscosity.</p>
11 to 12	<p><u>DEGREE'S OF SURFACE PREPARATION</u></p> <p>Practice of hand cleaning process -removal of mild deposits.</p> <p>To remove loosely adhering dirt, grease, oil, rust with minimum time & effort.</p> <p>Techniques of normal cleaning by wire brush, chisels, scrappers and sand paper's.</p> <p>Practice of power tool cleaning methods.</p> <p>Use of hand grinders and disc grinder .</p> <p>Chemical cleaning methods.</p> <p><u>CREATION OF SURFACE ROUGHNESS FOR PAINTING</u></p> <p>1) Emulsion cleaning method's 2) Solvent wiping method's 3) Solvent cleaning method's 4) Water blasting methods 5) Flame cleaning methods 6) Sand blasting methods 7) Shot blasting methods</p> <p>1) Power tool cleaning method's :- For removing rust and old paint 2) Abrasive cleaning method's:-</p>	<p><u>Safety measures to avoid accidents & health hazards.</u></p> <p>1) Good House-keeping. 2) Personal hygiene. 3) Safety Equipments. 4) Maintain good ventilation. 5) Read material safety data sheet.</p> <p><u>First Aid Measures-For</u></p> <p>1) Eye, skin & Inhale Surface preparation is Good painting practice. 2) Paint will protect as long. 3) For proper adhesions. 4) Surface preparation take 60% of the total painting time action</p>	-do-	-do-

	<p>A) Natural abrasive B) Manufactured abrasive 3) Chemical cleaning method's:- A) Acid pickling method's B) Alkaline cleaning method's 4) Paint remover method's</p>			
13	<p><u>Mechanical surface preparation</u> Practice on removal of mild deposits. Common cleaning methods- scraping, blasting, solvent wiping etc. Practice of power tool cleaning methods. Use of hand grinders and disc grinder Chemical cleaning methods.</p>	Free hand sketching of small parts related to the trade.		
14 to 15	<p>Chemical surface preparation on metal - powder/surfacers/ electro deposition.</p> <ul style="list-style-type: none"> • Cleaning • Degreasing • Rinsing of Activation • Phosphating • Rinsing • Passivation <p>Practice of removal of heavy deposits On metal surface Emulsion cleaning Solvent cleaning Water blasting Flame cleaning</p>	Freehand sketching of simple assembled parts		
16	<p>Practice of Creating rough surface Power tool cleaning Abrasive cleaning Chemical cleaning and Acid cleaning</p>	Freehand sketching of simple assembled parts		
17	<p>Introducing a coat by phosphating Hot phosphating (Seven tank system) 01) Degreasing 02) Derusting 03) Phosphating</p>	Freehand sketching of simple assembled parts		

18 to 19	Importance of proper paint application Paint preparation/mixing Shade matching Paint filtration	Freehand sketching of simple assembled parts		
20	Spray painting on car body Paint dexterity with fixtures. Sealer dexterity with fixtures Spot repair dexterity Sanding dexterity Painting practice on moving conveyer Online polishing / touch-up dexterity	Revision and exercise on blue print reading		
21	<u>Type of spray painting</u> Manual spray painting (conventional) H.V.L.P. spray painting Airless & air assisted spray painting Electrostatic spray painting (liquid)	-do-		
22	Electrostatic spray painting (liquid) Rausburg No-1 process and No.-2 Electrostatic hand guns. Electro air gun staitair gun Rausburg electro-hydraulic gun. Practice on Rausburg Electrostatic blade coater.			
23 to 24	Electrostatic spray painting (liquid) Charging of the paints with H.V. system Handling of electromagnetic generators, □ Application of electrostatic spraying, Electrostatic spray painting (liquid) Safety devices spraying Handling of paint for electrostatic spraying Safety of machinery equipment Defects of process Parameters and control Electrostatic powder coating fluidized bed process (Dip) Electrostatic fluidized bed process	Revision		

	<p>Electrostatic powder spray Safety of equipment Defects of the process Parameter and control. Application technique of powder paint: Powder feed unit Electro spray gun Electro powder source Powder recovery system Dual component spraying Base coat / Cleared coat system Automotive top coats Cleared coat system Pearlescent Colour matching techniques Finger spotting Hard line matching Colour matching techniques for metallic colour. Closed pattern techniques Open pattern techniques Common paint defect. Defect remedies and precaution. Sagging / Run down Brush marks Orange peeling Spotting Wrinkling Testing of different paints</p> <ul style="list-style-type: none"> • Weight per litter Gloss • Viscosity Finish • Hardness <p>Introduction to New technology trends-epoxy and polyurethane coating</p>			
25	Revision			
26	Examination			

**LIST OF TOOLS AND EQUIPMENT FOR 20 TRAINEES + ONE
FOR THE TRADE OF INDUSTRIAL PAINTER**

A. TRAINEES TOOL KIT

Sl.no.	Name of the item	Quantity
1	Screw driver set 150,200,250mm	21 nos.
2.	Measuring tape-10 meters	21 nos.
3.	Flat brush-4", 3", 2" and 1"	21 nos.
4.	Lettering brush-2,4,6,8,10 no.	21 nos.
5.	Wooden rule 24"	21 nos.
6.	Glass pencil (any colour)	21 nos.
7.	Lead pencil HB, 2b, 4b, charcoal	21 nos.
8.	Putty knife-2", 4",	21 nos.
9.	Mask	21 nos.
10.	Apron (over all)	21 nos.
11	Blow lamp 1/2ltr/1 Ltr	2nos. each
12	Steel wire brush 50 mmX150 mm	21 nos.
13	Scriber	21 nos.
14	Putty Knives 6"	21 nos. each
15	Marking Gauge	5 nos.
16	Plier insulated 150mm	21 nos.
17	Nose Plier insulated 150mm	21 nos.
18	Screw drivers 150mm	21 nos.
19	Electrician testing Pencil (Line/Neon tester)	21 nos.
20	Rule Steel 300mm	21 nos.
21	Punch Centre 150mm X 9mm	21 nos.
22	Heavy duty screw driver 200mm	21 nos.
23	Hammer Ball Peen 0.50Kg with (handle wooden)	21 nos.
24	Hammer Cross Peen 100gms. With (handle wooden)	21 nos.
25	Pliers Side Cutting insulated 150mm	21 nos.
26	Pincers 150mm	21 nos.
27	Single straight ladder 8' wooden (9 Fit)	2 nos.
28	Step ladder-12' aluminum	2 nos.
29	Extension ladder	2 nos.
30	Scrapping knife	21 nos.
31	Chisel knife	21 nos.
32	Pallet knife	21 nos.
33	Chisels 1", 2" (Each 4 Nos)	21 nos.
34	Face mask	21 nos.
35	Hand gloves-solvent(20 pairs)	21 nos.

36	Safety goggles	21 nos.
37	Airless pumps (Wagner with complete accessories Airless spray equipment.)	2 nos.
38	Spanner set 6 to 32mm set DE	2 nos.
39	Adjustable spanner-300 mm	4 nos.
40	Steel tape-10 meters	4 nos.
41	Bench vice 120mm, 150mm (each Two nos)	4 4 nos.
42	Spray gun (painting) 1 ltr, ½ ltr. Each	2 nos.
43	Air filter	2 nos.
44	air hoses pipe-20 meter with hosepipe	2 no.
45	Regulators for paints	2 nos.
46	Paint filter-conical	21 nos.
47	Fume filter mask	21 nos. .
48	Out side spring caliber 150 mm	4 nos.
49	Inside spring caliber 150 mm	4 nos.
50	Divider spring 150 mm	4 nos.
51	Centre punch 100 mm	4 nos.
52	File flat 2 nd cut 250 mm	4 nos.
53	Ordinary wooden mallet 50 mm	4 nos.
54	Cross pen hammer 0.25kg with handle	4 nos.
55	Snip straight 250 mm	4 nos.
56	Right cut snip 250 mm	4nos.
57	Steel wire brush	4 nos.
58	Marking gauge	4 nos.
59	Tennon saw 300 mm to 375 mm	2 nos.
60	Jack plane	2nos.
61	Smoothing plane	2 nos.
62	Carpenter hammer	2 nos.
63	Chisel farmer 6 mm to 25 mm set	2 nos.
64	Chisel mortise 9 mm	2 nos.
65	Trying plane	2 nos.
66	File flat 2 nd cut	4 nos.

B. WORKSHOP FURNITURE

Sl.No.	Name and description of the item	Qty.
1	Suitable Work bench-4' x 6'	4 nos.
2	Stools Suitable height.	20 nos.
5	Trainees locker 20 pigeon	2 nos.
6	First-aid box	2 nos.
7	Book shelf (glass panel) 3' x 6' (four partions)	2 no.
8	Storage Rack	2 nos.
9	Storage shelf	2 nos.
10	Exhaust fan heavy duty	1 no.
11	Computer table	5 nos.
12	Computer chair	20 nos.
13	Fire extinguisher	2 no.