

2012

Loy Low

X W/o
Tools List

INDUSTRIAL SCHOOLS

REVISED TRADE SYLLABUS

**MECHANIC-REFRIGERATION
AIR- CONDITIONING &
CENTRAL PLANT.**

LIST OF COMMITTEE MEMBERS
FOR THE TRADE OF MECHANIC REFRIGERATION & AIR
CONDITIONING & CENTRAL PLANT

LEADER

1. MR. V.NAMMALWAR D.M.E
TRAINING OFFICER
GOVT. I.T.I
TUTICORIN

MEMBERS

1. S.JEFRIL
CORRESPONDENT
KRIMSON INDUSTRIAL SCHOOL
PALAYAMKOTTAI
TIRUNELVELI

2. P.DINKARAN
INSTRUCTOR
SHALVATION ARMY INDUSTRIAL SCHOOL
NAGERCOIL

PROPOSED UNITS AND THEIR COVERAGE IN THE SYLLABUS

UNIT	UNIT DESCRIPTION	NO.OF WEEKS
1	General Engineering Training	13
2	Identification and Servicing, Patches basics of tools, Components & accessories of refrigeration system	8
3	Study of refrigerants and servicing of domestic & commercial appliances	11
4	Servicing overhaul of commercial compressor, controls and storages, commercial refrigerator	11
5	Servicing of small A plants, repair maintenance and refitting of various appliances	9
	Total	52

UNIT WISE DISTRIBUTION OF PRACTICAL SKILLS

1. General Engineering Training. Unit A
2. Refrigeration basic of servicing and Identification of components of various Refrigeration system Unit B
3. Servicing and refrigeration used in various appliances & R.A.C equipments Of Domestic & Commercial appliances Unit C
4. Servicing and overhaul of commercial appliances and commercial refrigeration Plants & Industrial training. Unit D
5. Repair maintenance & Servicing of Air-Conditioning Plant/Deep freezer/ Commercial storage etc Retrofitting. F various appliances with HCs/ HFCs. Unit E

WEEK WISE DISTRIBUTION OF PRACTICAL SKILLS

UNIT A

UNIT	TRAINING SKILL AREA	NO.OF WEEK	WEEK NO.	
			FROM	TO
A-1	Introduction, Orientation Safety	1	1	1
A-2	Basic Fitting	3	2	4
A-3	Basic Sheet Metal	1	5	
A-4	Basic Welding, Brazing	3	6	8
A-5	Basic Electro Mechanical Devices*	1	9	
A-6	Basic Electrical	4	10	13

WEEK WISE DISTRIBUTION OF PRACTICAL SKILLS

UNIT B

UNIT	TRAINING SKILL AREA	NO.OF WEEK	WEEK NO.	
			FROM	TO
B-1	Refrigeration Systems & Servicing Basics and Practices including use of tools	3	14	16
B-2	Identifications and Servicing components like compressor etc and other accessories & controls of Refrigeration system	5	17	21

WEEK WISE DISTRIBUTION OF PRACTICAL SKILLS

UNIT C

UNIT	TRAINING SKILL AREA	NO.OF WEEK	WEEK NO.	
			FROM	TO
C-1	Refrigerants, Handling, Safety, Leak Testing, Evacuation & Charging	4	22	25
C-2	Servicing Refrigerators	3	26	28
C-3	Servicing Air-Conditioners	3	29	31
	Revision & Test	1	32	

WEEK WISE DISTRIBUTION OF PRACTICAL SKILLS

UNIT D

UNIT	TRAINING SKILL AREA	NO.OF WEEK	WEEK NO.	
			FROM	TO
D-1	Servicing Commercial Appliances	4	33	36
D-2	Overhaul & Service of Compressor, Condenser, chillers, Fin & Tube Evaporators and controls	5	37	41
D-3	Industrial Training	2	42	43

WEEK WISE DISTRIBUTION OF PRACTICAL SKILLS

UNIT E

UNIT	TRAINING SKILL AREA	NO.OF WEEK	WEEK NO.	
			FROM	TO
E-1	Relative Humidity & Air Flow Measurement	1	44	
E-2	Servicing AC Plants (Small)	2	45	46
E-3	Repair Maintenance pf Domestic /Commercial Appliances	2	47	48
E-4	Retrofit Domestic appliances with HCs /HFCs	2	49	50
	Revision & Test	2	51	52

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**SYLLABUS FOR THE TRADE OF MECHANIC REFRIGERATION AND
AIR -CONDITIONING & CENTRAL PLANT DURATION OF TRAINING -1 YEAR**

UNIT A

Week No.	Practical	Theory	W/Shop Cal.	Engg. Drg.
1	2	3	4	5
1.	Introduction training familiarization with the Institute Type of practical training to be following & workshop safety.	Importance of the trade in the industrial and commercial field. Theoretical subjects to be taught Terminal performance objectives.	-	-
2.	Use of Bench vice simple marking and measuring tools Marking/Layout practice as per Blue Chipping with Flat chisel and hammer.	Method of marking, media, simple marking measuring tools & their use, chisel, hacksaw frame File & their use	Fraction addition and subtraction.	Free hand sketching of straight line, square, rectangle etc.
3.	Filing flat, square & curved surfaces & slots, grooves & angular profile.	Study about files types specification uses, care and safety aspects.	Fraction multiplication & division.	Freehand sketching polygon, hexagon, circle & hollow circle.
4.	Drilling clear and blind hole, counter sinking, counter boring drill bit grinding and reaming use of hand and power drills. Tapping clear and blind hole. Threading by die, care and safety.	Drills types specifications, uses and safety aspects, Drilling speed, feed & coolant Tapping and dieing.	Decimal fraction addition & subtraction.	Free hand sketching of simple solid cube & cuboids etc.
5.	Use of sheet metal tools and equipment care and safety sheet metal working basic comprising, cutting, bending at the edges, of sheet metal screws for joining. Riveting, using rivets for joints.	Sheet metal tools & equipment type specification care and safety, types of sheet metal joints and their use.	Decimal fraction multiplication & subtraction.	Free hand sketching of simple solid like cylinder, hollow cylinder etc.
6.	Practice of Arc Welding on thin sheet metal. Welding tools and equipment care and safety Electric welding culmett setting, shirking and r aintaining arc.	Introduction to basic principles of commonly used welding processes arc welding. Welding tools and equipment type specification and use.	Conversion of common to decimal fraction.	Use of different type of lines.
7.	Use of appropriate torches flames and fluxes practical on LPG and Air LPG/Blow lamp.	Method of gas welding gas used and flames adjustment, brazing in terms of temperature, filler materials, joint straight and applications use of oxyacetylene and LPG for brazing.	Conversion of decimal to common fraction.	Use of different symbol for drawing.

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8.	Operating and testing solid state Thermostats, contactors, starters, relays, pressure controls etc.	Use and functions of Electronic thermostats, conductors, starter, pressure, controls, solenoids, timers, crankcase, heaters etc.	Reduction of Common fraction to decimal fraction.	Freehand sketching of nut, bolt & washers etc.
9.	Use of electrician hand tools, safety precaution and first aid joints on single and standard conductors.	Electrician hand tools type specification, use, care and safety, common terms used in the trade conductors and insulator study about symbols also.	Units and measurements with some constants.	Freehand sketching on simple trade objects.
10.	Measuring of current voltage, power and energy by voltmeter, Ammeter, watt meter & energy meter use of multimeters etc.	Electrical work, power and energy - their calculation in simple electrical circuit type use & construction of common electrical measuring instrument.	Fundamental and derived units and their uses.	Free hand sketching on simple trade objects.
11.	Formation of simple electrical circuit, series circuit and parallel circuit, measuring, insulation resistance & earth resistances earthing & fuses.	Simple electrical circuit essential requirement of electrical circuit like series and parallel circuit. Different types of resistance earthing & fuses.	Study of laws of motion force and there measurement.	Simple orthographic projection using 1 st angle.
12.	Care maintenance and running of different A.C. single and poly phase motor, starter and starting methods like CSCR, PSC, and CSIR etc. Use of current and potential relays, capacitor etc.	A.C. motors starters and working principles specification & use care & safety run start capacitors PTC's and other protection devices.	Work, Power, Energy sources of energy, Kinetic and potential Energy.	Simple orthographic projection using 3 rd angle projection.
13.	Identification of components in a refrigeration system like compressor, condenser, Evaporator, Metering devices Refrigeration tubing, filter driers etc. For various refrigerating and air-conditioning machines.	Fundamentals of refrigeration and understanding and types of refrigeration system, its components, working etc.	Problems based on work, power & energy.	Practices of simple orthographic projection on 1 st angle and 3 rd angle projection.

Dr. S. S. Srinivasan

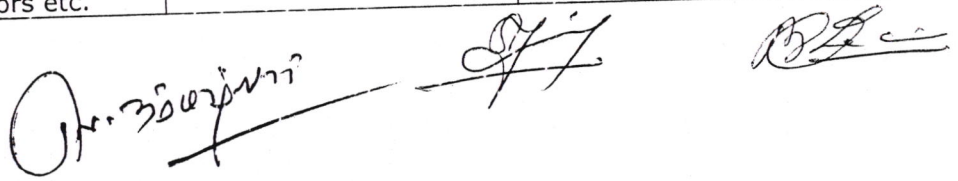
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SYLLABUS FOR THE TRADE OF MECHANIC REFRIGERATION AND AIR -CONDITIONING & CENTRAL PLANT DURATION OF TRAINING -1 YEAR

UNIT -B

Week No.	Practical	Theory	W/Shop Cal.	Engg. Drg.
1	2	3	4	5
14.	Use of general & special tools used in refrigeration practice working on refrigerators copper tubing & cutting, bending, flaring, swaging.	Temperature, pressure relationships, the refrigeration cycle, sensible and latent heats and sub-cooling understand cu-tubes used in refrigeration different process based on cu-tubes.	Heat and temperature units of heat differences between heat & temperature.	Simple orthographic projection using 1 st angle and 3 rd angle projection.
15.	Brazing of tube joints copper to copper, cu to steel, cu to Brass using Air - LPG and oxy Acetylene of the above gases with the right torches, Brazing filler rods, flared joints, compression joints, Distinguishing between good and bad joints.	Theory of brazing safe handling of cylinders. Use of right torches, tips & flame. Use of appropriate Brazing filler rods and fluxy.	Measurement of Temperature, pressure Atmospheric, absolute barometric and gauges pressure bourdon gauges, compound and vacuum gauges.	Sketching of different views of simple solid and hollow bodies.
16.	Familiarization with the internal construction and identification of components in Hermetic reciprocal and Rotary compressors, open type Reciprocal compressors Semi-Hermetic compressors Hermetic scroll compressors.	Working principals and construction of various types of compressor like. Hermetic, Semi-Hermetic & open type compressors of reciprocation rotary, scroll & Rotary etc.	Evaporation, Boiling Condensation, freezing effect, types of heat, vapour and gases saturated and super heated vapours.	Sketching of different views of simple solid and hollow bodies.
17.	Familiarization with condensers & Evaporator in refrigerators, Bottle/water coolers, window type Air conditioners, car AC's etc. Condensing units servicing of condenser and frost free refrigerators etc.	Dry Expansion type, shell & tube, flooded type etc evaporators and types of condenser like static condenser, Forced Draught, coil and sheel & stube type and others etc.	Conversion of centigrade and Fahrenheit problems percentage and it application.	Sketching of different views of simple solid and hollow bodies.



18.	Brazing of capillaries use of thermostatic expansion valve (TXV'S) study of all accessories & their location in the ref. System, Pencil type & Removable core filter drier, Accumulator, Receivers, Crank case heaters.	Metering devices role, types of metering devices fixed and modulating orifice controls, capillaries, float alves, thermostatic and automatic expansion valves oil separators, receivers & heat exchangers.	Percentage & its application and square root based problems.	Isometric views of simple objects such as cubes cuboids, prism etc.
19.	Operation & testing of bimetallic thermostats. Fluid pressure bellows types thermostats selting & testing of high and low pressure control.	Motor (or) system controls, Basic control, thermostat switch, low & high pressure cut off control and solenoid valves, Dual pressure control etc.	Application of Algebraic, symbol, addition, subtraction, multiplication & Division.	Isometric views of simple object such as cubes, Rectangular, solid, prism etc.
20.	Operation and testing of overload relays, internal OLP, receivers, filter drivers, slingh glass, mop valves and solenoid valves.	Safety control Electric overload protectors, relays, pressure safety switch, receiver, filter driers and valves etc.	Ratio & Proportions & its application.	Use of drawing instrument. T-Square Drawing boards.
21.	Refrigerant cylinders Identification of refrigerants safety in handling of refrigerants. Debraze to remove component-needling changes. Colour coding, its care and safety.	Refrigerants, Historical Development tili today physical and chemical thermal properties of various types o CFC'S. Its care and safety.	Simple equation & transposition problems.	Use of drawing instrument. T-Square. Drawing boards.

Dr. S. S. Srinivasan

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**SYLLABUS FOR THE TRADE OF MECHANIC REFRIGERATION AND
AIR -CONDITIONING & CENTRAL PLANT DURATION OF TRAINING -1 YEAR**

UNIT-C

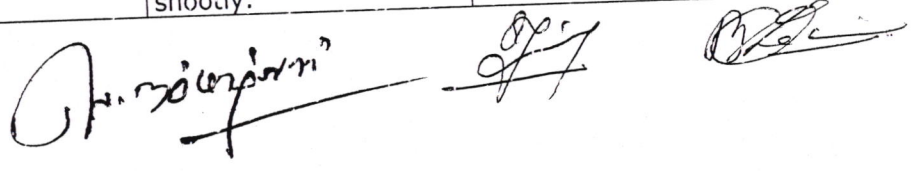
Week No.	Practical	Theory	W/Shop Cal.	Engg. Drg.
1	2	3	4	5
22.	Clean / flush with dry nitrogen chemicals trichloro ethylene, safety in handling N2 cylinder with 2 stage regulator, Evacuation, process, use of gauge manifolds etc. Leak testing, charging & its care and safety.	Study of ozone rules 200m moread protected & India CFC/HCFC phase at schedules, Recovery/ Recycling process Hygiene in a refrigeration system. Importance of evacuation of moisture and non-condensable gases.	Simple algebraic problems and modes of heat transfer.	Use of different types of scales, inch & mm lettering number of alphabets.
23.	Retrofitting of a CFC filled Domestic refrigerator with hydrocarbons using sealed components. Repair / service techniques & ensuring safety during brazing, evacuation, charging while using on HCs	Changes in components while retrofitting CFC appliances with HC refrigerants. Flammability issues to be addressed using sealed components.	Gas laws & perfect & real gases, Dalton's law Geometric, properties like angle, triangle circle, line etc.	Use of different types of scales, inch & mm lettering, number of alphabets.
24.	Retrofitting with HFC's and repair/ service with HCFs Its are and safety.	Changes in components while retrofitting HFC refrigerant is changes in compressors, lubricating oil need of filters driers of XH7 / XH9 & greater risk of moisture.	Properties and uses of copper, zinc, lead, tin, aluminum brass, bronze etc.	Drawing of simple figure and solid with dimensions & titles.
25.	Direct cooled domestic refrigerator servicing procedure of cleaning / inspection / testing of components in the cabinet & doors. Training the electrical and sealed refrigerant system & components testing of thermostats, electrical wiring practice defrosts system etc. Reassembly and testing for performance.	Study of constructional feature of refrigerator & components like door, gaskets, put Insulation, Electrical components, chiller tray & wiring drawing pressure, evaporator condensers etc.	Meaning of tenacity, elasticity malleability etc Hardening, Tempering on heat treatment.	Projection of square circle polygon etc.

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26.	Frost free Refrigerators:- Stripping of the components, tracing Electric circuit, thermostats, Defrost heaters, Cleaning Inspection / Testing of components.	Study of frost free refrigerator parts the forced draft cooling Air Duct circuit automatic defrost system, hot gas lines to prevent condensation on cabinet.	In mensuration finding the values area of square rectangle and volume of cube & cuboids or rectangular solid.	Projection of square, circle polygon etc.
27.	Trouble shooting common problems in refrigerator like: - No cooling, poor cooling, High current, Electrical Tripping, Wiring leaks, water leakage, Excess frost etc. Use of proper tools & instrument like gauge measuring Instrument.	Theory behind the causes of the problems the analytical approach to trouble shooting need for right instrument & tools to trouble shooting.	Find the values area of triangle, circle, hollow circle and volume of cylinder, hollow cylinder study of mass density.	Projection of solid & hollow object.
28.	Servicing of window type air conditioner cleaning / inspection / Testing of components like outer grapper, Grills Blower, Motor, Condenser, fan, tray, position, evaporator & condenser capacitor (Star & Run) PTC's Electrical Wiring etc.	Study of construction & function of window Type air conditioner Role of each component principals of working Evaporative cooling of condenser.	Solveing of simple equation.	Projection of solid & hollow object.
29.	Servicing of blowers, motors used in Air conditioners for Evaporators and condensers, Relays, PTC & HP-LP switches control devices.	Description, Construction function of different types of blower and fan's motor etc used for evaporators and condenser.	Properties and case of case iron, wrought iron and Alloy steel.	Projection of solid & hollow cylinder.
30.	Trouble Shooting on air-conditioner unit: - Poor cooling, short-cycling, Highnoise level in Room Condenser Unit, Water dripping in room unit, Sweating of room unit, Problem based on electronic controls.	Importance of maintaining filters cleanliness. The problem in installation with evaporator at higher / lower levels & vice versa. Theory behind the problems listed under Trouble shooting and analytical approach to trouble shootly.	Solveing simple simultaneous equations with two unknown quantities.	View of various solid and hollow object & cut by section plane.



31.	Study of water cooler construction (Instantaneous & Storage) water circuit, Refrigeration circuit etc. Working and control Trouble Shooting of commonly faced problems failures etc. and wiring circuit practice.	Water storage, distribution & drainage Refrigeration system using R-22 & components in lieu of R-12 Electrical & Control system Insulation. Trouble shooting of commonly occurred problems. Its care and safety.	Young's modulus of elasticity.	View of various solid and hollow object & cut by section plane.
32.	Revision & Test			
33.	Checking & Servicing vesicular preventive maintenance & Retrofitting with HCS or HFC 134 a its wiring circuit & care & safety.	Construction & function of visicoolers, description & Retrofitting with HC & or HFC 134a.	Simple machines Mechanical Advantage in wheel and Axle & simple screw jack.	Isometric views to orthographic views.
34.	Checking & Servicing of Bottle coolers / Deep freezers, Description, Maintenances & Retrofitting with HCS or HFC 134.	Chert type bottle coolers / Deep freezers, Description Construction & function substituting R-12 with R-134a or Hydro Carbons.	Problem based on Simple machines pulley block and lever.	Isometric views to orthographic views.
35.	Trouble Shooting, based on servicing & tested, Retrofitting of Visicoolers / Deep freezers / Bottle Coolers.	Retrofitting, servicing & testing of visicoolers / Bottle coolers / Deep freezers on trouble shooting based on various problem.	Problem based on linear expansion.	Isometric views to orthographic views.

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**SYLLABUS FOR THE TRADE OF MECHANIC REFRIGERATION AND
AIR -CONDITIONING & CENTRAL PLANT DURATION OF TRAINING --1 YEAR**

UNIT-D

Week No.	Practical	Theory	W/Shop Cal.	Engg. Drg.
1	2	3	4	5
36.	Dismantling of commercial type reciprocating compressor, checking & servicing valve plate and piston assemble, lapping valve plate etc. Fitting and testing, service valve.	Commercial type reciprocating compressor - their types - construction and application - performance - factor influencing volumetric efficiency.	Heat lost or gained by the body.	Isometric views to orthographic views.
37.	Checking and servicing lubricating system - bearing, shaft seal - capacity control etc.	Lubrication system & Properties Types of lubrication splash and forced feed - oil function - capacity control - their function construction and application.	Problems based on Heat lost or gained by the body.	Isometric views to orthographic views.
38.	Cutting gasket and assembly of compressor. Testing efficiency.	Various compressor like centrifugal / screw compressors it construction and application Refrigerants used.	Velocity and speed and its applied problem.	Isometric views to orthographic views.
39.	Servicing and checking of water-cooled condenser receiver / evaporative condenser & testing/ Its care and safety.	Condenser - its type - water cooled condenser - Evaporative condenser - their function, construction.	Problems based on power Transmission.	Isometric views to orthographic views.
40.	Servicing of cooling tower/ water circulatory pump its care and maintenance installation. Its care and safety.	Cooling tower - its principle, types, capacity, construction & Efficiency principles of working of a water circulating pump.	Problems based on power Transmission.	Isometric views to orthographic views.
41.	Car Air-conditioning compressor Assembling and Gasket cutting Efficiency testing and car A/C gas charging. Cold storage plant Maintenance.	Car Air-conditioning compressor condenser - Evaporative condenser - their function, construction. Cold storage plant construction & Efficiency principles of working.	Horsepower Indicated and brake horse power and its units.	Isometric views to orthographic views.
42.	Industrial training on central Air-conditioning plant etc.	Industrial training on central Air-conditioning plant etc.	Industrial training on central Air - conditioning plant etc.	Industrial training on central Air-conditioning plant etc.

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47.	Repair and maintenance of refrigerator / Deep freezer wiring practice, its care & safety.	Review of commonly faced problem and approach to problem solving based on troubleshooting / using right instruments / tools. Its care & safety.	Estimating and costing Applied problems based on various equipments refrigerator, Air-conditioner Water cooler etc.	Freehand sketch on Applied theory subject hand tools & equipments like refrigerator, Air conditioner etc.
48.	Repair and maintenance of room air conditioner / storage type plant, wiring practice, its care & safety.	Trouble diagnosis and remedial use of different control review of safety measurement and steps. Its care & safety.	Heat load calculation based on Air-conditioner capacity of voltage stabilizer etc.	Freehand sketch on applied theory subject based on wiring circuit on various appliances.
49.	Retrofitting refrigerator / Deep freezer with HCs, wiring practice, its care & safety.	Retrofitting of sealed components. Review of commonly occurring problems and analytical approach to trouble shooting.	Study of insulating material and their uses.	Freehand sketch on applied theory subject based on wiring circuit on various appliances like refrigerator, A/C, Water Cooler etc.
50.	Retrofitting of window Room Air Conditioners / Storage type plant. Its care and safety.	Choice of Economic alternative If HFC & 134A /HCFC Review of commonly occurring problems & approach to trouble shooting.	Study of various materials used in the component like compressor, condenser etc.	Freehand sketch on applied theory subject based on wiring circuit on various appliances like refrigerator, A/C, Water Cooler etc.
51.	Revision			
52.	Test			

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ACHIEVEMENTS

1. General Engineering Training.
2. Identification and servicing, Praches basics of tools, components & accessories of refrigeration system.
3. Study of refrigerants and servicing of domestic & commercial appliances.
4. Servicing overhaul of commercial compressor, controls and storages, commercial refrigerator.
5. Servicing of small AC plants, repair maintenance and refitting of various appliances.

**TO BE ACHIEVED BY STUDENTS AFTER COMPLETION OF
LEARNING AGAINST VARIOUS UNITS**

After Unit 'A'

1. Use and manipulate fitter's hand tools and equipment it's care and safety.
2. Using fitter's hand tools carry out simple fitting jobs.
3. Use and manipulate sheet metal tools and equipment to carry out simple sheet metal jobs.
4. Use and manipulate welder's tools and equipment. Carry out simple gas and arc welding jobs and cutting and brazing.
5. Use and manipulate electricians Hand tools.
6. Use and manipulate electricians measuring instruments. Connect and operate Ac motors and starters single three phase.

Unit B: -

1. Use and manipulate refrigeration piping tools and equipment carry out tube bending, cutting, flaring, swaging, brazing joints using oxy Acetylene / Air LPG it's care and safety.
2. Identification, servicing, testing and checking performance of components, accessories and control of refrigeration system of domestic and commercial appliance of refrigeration and AC Plant.

Unit C: -

1. Knowledge of refrigerants and regulation in India for ODS phase out.
2. Retrofitting of CFC based appliances with non CFCs i.e. HCs, HFCs and HCFCs
3. Carrying out repairs / replacements of components, cleaning, leak testing, evacuation and charging refrigeration system using any refrigerant in domestic and commercial appliance.
4. Servicing and trouble shooting of various components in all Domestic and commercial stand at refrigeration and air-conditioning appliances.

Unit D: -

1. Servicing and overhauling open type compressors, condensing units, commercial cold storage.
2. Servicing condensers, cooling tower and commercial cold storages.
3. Operate and maintain small commercial cold storage plant.
4. Industrial training to be carrying out.

Unit E: -

1. Checking performance of small central / package AC installations in terms of Airflow, temperature and Relative humidity.
2. Service and operate a small package unit / Central AC Plant / Deep freezers / Vesicular.
3. Retrofit with non CFC Refrigerants, Refrigerators, Freezers and other commercial appliances.

INDUSTRIAL SCHOOLS

LIST OF TOOLS AND EQUIPMENTS FOR TRADE OF MECHANICS
REFRIGERATION AND AIR CONDITIONING & CENTRAL PLANT
FOR A BATCH OF 20 TRAINEES

S.No	DESCRIPTION	As Per the Syllabus for Standard List	Available List	Short-age	Per-cent-age
1.	Flaring tool set single type for tube 4.7 to 16mm OD	2 sets	2 sets	Nil	100%
2.	Swaging tool punch type set of size tube 4.7 to 16mm OD	2 sets	2 sets	Nil	100%
3.	Bending spring external type for copper tube 3 to 16mm OD Dia	1 set	1 set	Nil	100%
4.	Pipe cutter miniature for copper tube 3 to 16mm Dia	2	2	Nil	100%
5.	Pinch of tool, For copper tube 6 to 18 mm Dia	2	2	Nil	100%
6.	Ratched spanner of 6.4mm. sq. Reversible	1	1	Nil	100%
7.	Capillary plug gauge	1	1	Nil	100%
8.	Pinch off plier/crimping plier tool 6.18mm Dia	1	1	Nil	100%
9.	Spanner, double ended 4.7mm to 16mm	1 set	1 set	Nil	100%
10.	Spanner, double ended 19mm to 31.8mm	1 set	1 set	Nil	100%
11.	Ring Spanner off set 4.7 mm to 16mm	1 set	1 set	Nil	100%
12.	Ring Spanner off set 19mm to 31.8	1 set	1 set	Nil	100%
13.	Wrench adjustable length 150mm	1	1	Nil	100%
14.	Wrench adjustable length 200mm	1	1	Nil	100%
15.	Pipe wrench size 50 and, 150 mm	1 each	1 each	Nil	100%
16.	Valve Key Handle - 4.7 and 6.4mm sq	2 sets	2 sets	Nil	100%
17.	Pressure gauge diameter 65mm with recalibration set screw scale 0 to 35 Kg/sq cm	1	1	Nil	100%
18.	Compound gauge diameter 63mm. With recalibration set screw vaccum 76 pressure 15kg/sq cm	1	1	Nil	100%
19.	Serviceman thermometer in metal case, 30 to 130° C	1	1	Nil	100%
20.	Sling Psychometric mounted on aluminum bach scale -50°C to +50°C	1	1	Nil	100%
21.	Lapping plate 250 x 200mm	1	1	Nil	100%
22.	Punch hole for cutting gasket 4.7 to 16mm Dia	1	1	Nil	100%
23.	Scissor, gasket cutting, stainless steel, length 25mm	1	1	Nil	100%
24.	Screw driver, Plastic handle 10mm tip length 200, 250 mm	2 each	2 each	Nil	100%
25.	Screw driver, Plastic handle 6mm tip length 100, 150 mm	2 each	2 each	Nil	100%
26.	Philips screw driver-complete set in leather case	1 set	1 set	Nil	100%
27.	Pliers combination insulated, length 200mm	1	1	Nil	100%
28.	Pliers long nose, lenght 200 mm	1	1	Nil	100%

S.No	DESCRIPTION	As Per the Syllabus for Standard List	Available List	Shortage	Percentage
29	Pliers, Flat nose length 150mm	1	1	Nil	100%
30	Hammer Ball pein 450gm	1	1	Nil	100%
31	Hammer Ball pein 220gm	1	1	Nil	100%
32	Chisel Flat length 150mm	1	1	Nil	100%
33	Hacksaw tubular metal frame adjustable	2	2	Nil	100%
34	Scriber 150mm length	1	1	Nil	100%
35	Oil can	1	1	Nil	100%
36	File Flat medium, double cut length 200 mm	2	2	Nil	100%
37	File half round medium, double cut length 200 mm	2	2	Nil	100%
38	File half round fine double cut length 150 mm	1	1	Nil	100%
39	File round, fine double cut length 150 mm	2	2	Nil	100%
40	File flat, Fine double cut, length 150 mm	1	1	Nil	100%
41	File Square, Fine double cut length 150 mm	1	1	Nil	100%
42	Soldering iron exchangeable copper tip 85 watts	1	1	Nil	100%
43	Pipe bending tool lever type with degree indicator for tube OD 6.4 to 16 mm	1 set	1 set	Nil	100%
44	Blow-lamp capacity 1/2 liter	2	2	Nil	100%
45	Hand blower portable complete 1/10 HP	1	1	Nil	100%
46	Snipper sheet metal straight nose 200 mm	1	1	Nil	100%
47	Bench vice 75 mm - Jaw	2	2	Nil	100%
48	Oxy Acetylene welding set complete with cylinder	Cancelled	Cancelled	Nil	100%
49	Line tester 500 volt Heavy Duty	2	2	Nil	100%
50	Tong-tester 0-10-30 amps 0-500 (clamp on multimeter)	1	1	Nil	100%
51	Knife folded stainless steel - 150 mm	1	1	Nil	100%
52	Volt meter AC 0 to 5 amp	1	1	Nil	100%
53	Ammeter AC 0 to 5 amp	1	1	Nil	100%
54	Ammeter AC 0 to 5 amp	1	1	Nil	100%
55	Multimeter - Digital type	1	1	Nil	100%
56	Filler gauge 0.05mm 1 mm	1 set	1 set	Nil	100%
57	Refrigerant cylinder capacity 1/2 Kg	1	1	Nil	100%
58	Refrigerant cylinder capacity 2 Kg	1	1	Nil	100%
59	Evacuating and charging station as above but fitted with weighting scale up to 2 kg in lieu of (b) above and with accuracy of 1-1 gram for charging hydrocarbon	1	1	Nil	100%
60	Refrigerator compression type 165 litres	1	1	Nil	100%
61	Window air conditioning capacity 3000 K.cal/hr	1	1	Nil	100%

S.No	DESCRIPTION	As Per the Syllabus for Standard List	Available List	Short-age	Per-cent-age
62.	Bottle cooler 110 litre 1/6 HP	1	1	Nil	100%
63.	Water cooler storage type 100 litres 1/6 HP	1	1	Nil	100%
64.	Reciprocating Compressor	1	1	Nil	100%
65.	Welding table 900 x 900 x 700 mm. high	1	1	Nil	100%
66.	Work Bench 1000 x 600 x 800 mm. high	2	2	Nil	100%
67.	Alimirah 195 x 90 x 49 cm	1	1	Nil	100%
68.	Black board portable	1 set	1 set	Nil	100%
69.	Instructor table and chair	1	1	Nil	100%
70.	Sensor thermometer (Digital)	1	1	Nil	100%
71.	Fin Straightener / Fin Comp	1	1	Nil	100%
72.	HC refrigerant in cylinder 2 Kg capacity	1	1	Nil	100%
73.	134 A refrigerant in cylinder 2 Kg capacity	Cancelled	Cancelled	Nil	100%
74.	Refrigerator using 134-A refrigerate	1	1	Nil	100%
75.	Portable Air-LPG braking kit with 2 kg LPG cylinder torcher hoses standard make with straight flame / cyclone swirl Jet Flame	1	1	Nil	100%
76.	Dry N2 in cylinder with 2 stage regulator or commercial N2 in cylinder with driver unit and 2 stage regulators	1	1	Nil	100%
77.	Trichloroethylene bottle	Cancelled	Cancelled	Nil	100%
78.	Two way manifold with gauges	1	1	Nil	100%
79.	Filters drier for CFC-12 & HFC -134a for repairs Retrofits	Cancelled	Cancelled	Nil	100%
80.	Sealed ex-proof components for use in HC appliances Thermostats, sealed OLPs, Solid state PTCS Door Switch-Lamp holders	1	1	Nil	100%
81.	Safety gloves, eye protection glasses	2 each	2 each	Nil	100%
82.	Hermetic compressor for 134a	Cancelled	Cancelled	Nil	100%
83.	Brazing alloy rods for 1/4" to 7/8" tubes-cu to cu, cu to steel, cu to Bress and appropriate-fluxes	1 set	1 set	Nil	100%
84.	Hermetic compressor (1/8 hp to 1/2 hp) for use in repair work of appliances for CFCs and HCs	Cancelled	Cancelled	Nil	100%
85.	Compressor tester for small hermetic compressors	1	1	Nil	100%
86.	Hermetic compressor 1.5 T (AC)	Cancelled	Cancelled	Nil	100%
87.	Evaporator of frost free refrigerator	1	1	Nil	100%
88.	Accessories : Thermostatic expansion valve, distributors driers pencil solid core type etc., accumulators, receivers, bellows, type thermostats, H.P. Stat, L.P stat humidi stat solenoid valves	1set	1set	Nil	100%
89.	Electrical accessories : current & potential relays, start & run capacitors, PTCs, overload protectors, relays contactors	1	1	Nil	100%

S. No	DESCRIPTION	As Per the Syllabus for Standard List	Available List	Short- age	Per- cent- age
90	Fire Extinguisher	1	1	Nil	100%
91	Box Spanner Size 6.4 to 10mm	1 set	1 set	Nil	100%
92	Wrench adjustable length 250mm	1	1	Nil	100%
93	L-Allen Key set, Size 1.5 to 6.4mm	1	1	Nil	100%
94	T- Allen Key set, Size 5/32" to 1/8"	1	1	Nil	100%
95	Divider, spring joint length 150mm	Cancelled	Cancelled	Nil	100%
96	Caliper spring joint outside length 150mm	Cancelled	Cancelled	Nil	100%
97	Caliper spring joint inside length 150mm	Cancelled	Cancelled	Nil	100%
98	Caliper odd leg spring joint length 150mm	Cancelled	Cancelled	Nil	100%
99	Marking Block, Universal Spindle 200mm	Cancelled	Cancelled	Nil	100%
100	V-Block, with clamp 75mm	Cancelled	Cancelled	Nil	100%
101	Surface plate with stand 600 x 450mm	1 set	1 set	Nil	100%
102	Bench vice 120mm jaw	1	1	Nil	100%
103	Tap set with matching drill 3mm to 16mm size	Cancelled	Cancelled	Nil	100%
104	Tap set with matching drill SAE size	Cancelled	Cancelled	Nil	100%
105	Tap and die set 3mm to 16mm size	Cancelled	Cancelled		
106	Vernier Caliper length 250mm	Cancelled	Cancelled	Nil	100%
107	Micrometer, outside measurement 0-25mm	Cancelled	Cancelled	Nil	100%
108	Lockers of eight compartments	1	1	Nil	100%
109	Pipe threading dies & pipe vice	Cancelled	Cancelled	Nil	100%
110	Schraeder valve core removal tool	1	1	Nil	100%
111	First aid box	1	1	Nil	100%
112	Filler gauge 0.05mm - 1mm	1 set	1 set	Nil	100%
113	Wire gauge metric and whitworth	Cancelled	Cancelled	Nil	100%
114	Dial thermometer remote control, armoured capillary dial 75mm - 50°C to + 50°C	1	1	Nil	100%