

2. AIRCONDITIONING AND REFRIGERATION

1. INTRODUCTION

Air Conditioning and Refrigeration is an important area where in lot of self-employment opportunities are available. Now a day there is hardly a house / establishment without a refrigerator. Hence students after attaining skills in this area have ample opportunities.

2. OBJECTIVES OF THE COURSE

1. To know and understand refrigerator principles.
2. To know the various parts of the refrigerator.
3. Able to identify the faults in air coolers and refrigerators.
4. Able to under take repairs and able to replace parts where ever needed.

3. SKILLS TO BE PROVIDED

1. Able to identify faults in air conditioner and related equipment.
2. Able to locate the faults.
3. Able identify the parts.
4. Able to assemble and disassemble the parts in air conditioner or refrigerator.

4. EMPLOYMENT OPPORTUNITIES

1. Can be employed as a technician in any service oriented organization.
2. Can work as a technician in private buildings or apartments.
3. Can get self-employment as a technician.

5. Schemes Of Instruction Per Module

Module	Theory		On Job Training		Total	
	Hours	Weightage	Hours	Weightage	Hours	Weightage
I	72	30	216	70	288	100
Total	72	30	216	70	288	100

Schemes Of Instruction Per Week

Module	Theory	On the Job Training	Total
Modules I/II/III	6 Hours	18 Hours	24 Hours

6. SYLLABUS

MODULE – I: Basics of Refrigeration

Week	Theory Contents	On the Job Training
1	Importance of the trade in the industrial and commercial field. Theoretical subjects to be thought. Achievement to be made.	Induction training, familiarization with the institute. Type of practical training to be followed. Workshop safety.
2	Files, drills and their types, specification, use, care and safety drilling speed, feed and coolants.	Filing flat, square round and profile. Drilling clear and blind hole. Counter sinking, counter boring, grinding drill bit.
3	Sheet metal tools and equipment – type, specification, care and safety. Types of sheet metal joints and their use. Rivet and riveting – their types and use.	Use of sheet metal tools and equipment, care and safety. Making sheet metal joints as used in ducting. Riveting on sheet metal.
4	Soldering and brazing. Different types of solders. Composition and use of flux, their effect on metal. Method of soldering and brazing	Soldering and brazing on sheet metal joints.
5	Electrician hand tools, type, specification, use, care and safety. Common terms used in the trade. Conductors and insulators selected letters, symbols and sign as I.S.I rules for medium voltage.	Use of electrician hand tools. Safety precaution and first aid, joints on single and standard conductors and soldering.
6	A.C motor, starters and transformer.	Case maintenance and running of A.C single

	Their working principles, specification and use, care and safety.	and poly phase motor, starters and transformers
7	Refrigeration service tools. Type, specification and use. Refrigeration components. Type specification and use.	Use of refrigeration service tools care and safety.
8	Refrigeration principle, system of refrigeration and application of refrigeration.	Cutting bending and joining of copper tubing. Flaring, swaging and silver soldering.
9	Refrigeration compressor. Its function – mode of drive, type of compression, classification and application.	Dismantling reciprocating compressor, checking component parts- valve plate, reeds, piston, piston pin, seal etc
10	Reciprocating compressor, name, construction and function of component parts.	Servicing and testing compressor service value, shaft seal, piston assembly and valve plate assembly etc.
11	Space heating various methods of heating, function & Application.	Servicing the heating system.
12	Conducting internals for the Module – 1.	

MODULE – II: Refrigerator Components

Week	Theory Contents	On the Job Training
1	Hermetic compressor, its construction and application. Advantage and disadvantage of open unit and hermetic unit.	Dismantling of hermetic compressor. Checking and servicing of components. Assembly of compressor and testing.
2	Condenser – its function type and classification. Construction and application.	Servicing air-cooled condenser and liquid receiver, checking leak repair and testing.
3	Refrigeration control, function and type. Automatic, thermostatic and capillary control, construction, operation and application.	Checking automatic and thermostatic expansion valves and capillary tube. Servicing and testing.
4	Thermal insulating material. Their type, properties, use and safety.	Replacing thermal insulating material, install body and door liners and door gasket. Adjusting door alignment

5	Safety in handling refrigerant and cylinder. Color code of cylinder, method of refrigerant transfer	Handling of gas cylinder. Repair leaky cylinder, transfer of refrigerant.
6	Vacuum pump, vacuum gauge, and leak detectors, their type, specification, use care and safety.	Testing leak in the system using dry air, carbon dioxide, nitrogen. Vacuumizing and drying the system using deep vacuum pump, micron gauge, etc.
7	Refrigerator - different types -their type function and use. Trouble diagnosis and remedies.	Checking compression type refrigerator and different type fault finding, servicing and testing.
8	Window type air conditioner – their type, function and application. Trouble diagnosis and remedies.	Checking window type of air conditioner, faultfinding, servicing and testing.
9	Compressor lubrication, type of lubrication, splash and forced feed, compressor oil function and characteristics. Compressor capacity control, different method and application.	Checking lubricating system, servicing oil pump etc. fitting and testing. Checking and servicing capacity control of the compressor. Fitting and testing.
10	Split air conditioner maintenances, trouble diagnosis and Remedies.	Repair and maintenance of split air conditioner.
11	Air conditioning plant operation, common troubles and Remedies.	Exposure to air conditioning plant operation, care and maintenance.
12	Conducting internals for the Module – 1.	

MODULE – III : Servicing of R & A.C. Units

Week	Theory Contents	On the Job Training
1	Condenser – its type and capacity. Water-cooled condenser – their type construction and application.	Servicing of water-cooled condenser and receiver, checking leakage, repairing and testing.
2	Evaporative condenser – their function, construction and application	Servicing of water circulating pump and accessories. Its care and maintenance.
3	Water circulating pump and accessories – their type function and application.	Servicing of water circulating pump and accessories. Its care and maintenance.
4	Water refrigerant valve and control. High-pressure safety control etc. their type, construction and application.	Servicing of water regulating valve, solenoid valve, high pressure safety control etc.

5	Commercial type refrigerant and electric control. Their construction and application.	Servicing of commercial refrigerant and electric control, its care and safety.
6	Method of installing compressor, vibration eliminator and shock absorber their type and application.	Installing commercial type, compressor. Use of vibration eliminator and shock absorber.
7	Method of pressure testing, leak detection and vacuumizing the system.	Pressure testing, leak detection and evacuating the system.
8	Method of charging gas to the system, and testing efficiency.	Charging gas to the unit with cylinder and testing the leakage detection process.
9	Study of air – dew point, psychometric chart, humidity, measurement of humidity. Etc.	Care, maintenance and use of sling psychomotor, hygrometer, humidistat, remote bulb, thermometer, thermostat etc.
10	Blower damper, air filters etc. their type, construction and application.	Servicing of blower damper, air filters etc. care and maintenance.
11	Water cooler trouble diagnosis and remedies	Repair and maintenance of water cooler.
12	Conducting internals for the Module – 1.	

7. LIST OF TOOLS & EQUIPMENT

S.NO	Description	Instructor
1	Flaring tools set, single type for tube 4.7 to 16 mm O.D	1 set
2	Swaging tool, punch type, set of size for tube 4.7 mm to 16 mm O.D	1 set
3	Bending spring external type for copper tube	1 set
4	Pipe cutter miniature for copper tube	1 set
5	Ratchet spanner 6.4 mm sq.reversible	1 set
6	Valve key "T" handle – 4.7 and 6.4 mm sq	1 set
7	Pressure gauge, diameter 63 mm with recalibration set screw,	1 set
8	Service men thermometer in metal in metal case –30 to + 30 degree C	1 set
9	Sling psychrometer mounted on aluminum back, scale –50 C to +50 degree C portable in leather case	1 set
10	Gas leak detector for halogen gas	1 set
11	Lapping plate 250x200 mm	1 set
12	Line tester 500 volt, heavy duty	1 set
13	Punch hole for cutting gasket 4.7 mm to 16 mm dia	1 set

14	Scissor, gasket cutting stainless steel, length 250 mm	1 set
15	L-Allen key set size 1.5 mm to 6.4 mm	1 set
16	T – Allen key set size 5/32" & 1/8"	1 set
17	Screw driver, plastic handle, 6 mm tip length 100, 150	1 set
18	Screw driver, plastic handle, 10 mm tip, length 200, 250 mm	1 set
19	Pliers combination insulated, length 200 mm	1 set
20	Pliers long nose, length 200 mm	1 set
21	Knife folded stainless steel – 6"	1 set
22	Wrench adjustable length 200 mm	1 set
23	Wrench adjustable length 250 mm	1 set
24	Spanner, double ended 4.7 mm to 16 mm	1 set
25	Ring spanner, off set 4.7 mm to 16 mm	1 set
26	Philips screw driver – complete set in leather case	1 set
27	Oil can pressure type – 1 ltr can	1 set
28	Soldering iron exchangeable copper tip 65 watts	1 set
29	Tape measuring 2 m graduation in mm	1 set
30	Hammer plastic 300 gm	1 set
31	Hammer ball pein 450 gm	1 set
32	Hack saw tabular metal frame adjustable	1 set
33	File flat medium, double cut, length 200 mm	1 set
34	File half round medium, double cut length 200mm	1 set
35	Chisel flat, length 150 mm	1 set
36	Scriber 150 mm length	1 set
37	Divider spring joint length	1 set
38	Caliper spring joint, outside length 150 mm	1 set
39	Caliper spring joint, inside length 150 mm	1 set
40	Center punch length 100 mm	1 set

8. QUALIFICATION FOR TEACHING FACULTY

Diploma in Mechanical Engineering (Or)
R & AC Mechanic with 5 years of experience.

9. REFERENCE BOOKS

- ❖ Fundamentals of Air Conditioning and Refrigerator by any Indian author.
- ❖ Handbook on Air Conditioning and Refrigeration.

10. LIST OF PARTICIPANTS

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