

Curricula for
Automobile Air Conditioning Mechanic
(1 Year)

Contents

Overall objective of the course.....	3
Competencies gained after completion of the course.....	3
Job opportunities available immediately and in the future.....	3
Overview about the program.....	4
Tool & Die Making-1 Curriculum Contents.....	5
Module 1: Fundamentals of Air Conditioning	5
Module 2: Basic Electricity	8
Module 3: Tools/Equipment, System components and Materials....	10
Module 4: Workshop Practice	15
Assessment.....	20
Module 1: : Fundamentals of Air Conditioning	20
Module 2: Basic Electricity	20
Module 3: Tools/Equipment, System components and Materials...	21
Module 4: Workshop Practice	21
Curriculum developers.....	22
NCRC members.....	22

Overall objective of course

There are too many institutions which are offering the courses in the field of Refrigeration and Air Conditioning, but there is lack of specialized courses designed for a specific field of automobile air-conditioning, thus the purpose this course is to provide the candidates specialized theoretical and practical knowledge to fulfill the market demand in the relevant field .It is basically a practical base course along with a little portion of theoretical knowledge necessary to accomplish the practical tasks. So after completing the course candidates may be able to troubleshoot, repair, maintain, install or dismantle the automobile air conditioning system.

Competencies gained after completion of course

- Know the basic concept, need and application of the automobile air conditioning.
- Conscious about the environmental issues.
- Identify, select, use, safely handle and store the basic and special purpose tools and equipment.
- Identify and demonstrate the working principle of automobile air conditioning components.
- Troubleshoot, repair, maintain, install or dismantle the automobile air conditioning system

Job opportunities available immediately and in the future

- Local/International market of automobile air conditioning workshop.
- Motor vehicle manufacturing industries.
- Private business of sale and service.
- Public sector.

Overview about the Programme

Module Title and Aim	Learning Units	Theory hours	Workplace hours
<p style="text-align: center;">Module 1: Fundamentals of Air Conditioning</p> <p>Aim: To introduce the candidate to basic concept of air conditioning and fundamentals of air conditioning.</p>	1. Have an introduction to air conditioning.	60 hrs	240 hrs
	2. Measure the heat and temperature.		
	3. Measure the pressure and vacuum.		
	4. Understand the pressure temperature relationship		
	5. Understand the psychrometry		
<p style="text-align: center;">Module 2: Basic Electricity</p> <p>Aim: To introduce the candidate to electrical principles, electrical circuits and electrical Components.</p>	1. Have basic concept about the principles of electricity	60 hrs	240 hrs
	2. Sketch out the electrical circuits		
	3. Prepare electrical circuits with different components.		
<p style="text-align: center;">Module 3: Tools/Equipment, System components and Materials.</p> <p>Aim: To enable the trainees to identify select, use and store the basic hand tools/equipment, identify and understand the function of different auto mobile air conditioning system components.</p>	1. Identify select and use the basic and special auto mobile air conditioning Tools and Equipment.	80 hrs	320 hrs
	2. Identify and understand the function of Auto mobile air conditioning components.		
	3. Identify, select and use the different Materials.		
<p style="text-align: center;">Module 4: Workshop Practice</p> <p>Aim: To enable the trainee to complete the tasks of system trouble shooting, repairing and servicing and maintenance.</p>	1. Carry out different practical tasks.	120 hrs	480 hrs

Automobile Air Conditioning Mechanic Curriculum Contents

(Teaching and Learning Guide)

Module 1: Fundamentals of Air Conditioning

Objective of the Module: To introduce the candidate to:

- Basic concept of air conditioning.
- Fundamentals of Air Conditioning.

Duration: 300 hours **Theory:** 60 hours **Practice:** 240 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Have an introduction to air conditioning.	1.1 Understand the air conditioning.	1.11 Define the air conditioning.	60 hrs.	<ul style="list-style-type: none"> • Air conditioning model. • Teaching aids. 	Class room/worksh op/laboratory.
	1.2 Knowledge about the scope of air conditioning.	1.21 Explain the need of air conditioning. 1.22 Describe the scope of air conditioning.			
	1.3 Be able to have the basic concept about the working principle of air conditioning cycle.	1.31 Describe the basic components of mechanical air conditioning cycle. 1.32 Demonstrate that how the basic air conditioning cycle works?			
2. Measure the heat and temperature.	2.1 Understand the Heat and temperature.	2.11 Define the: <ul style="list-style-type: none"> • Heat. • Temperature. • Units of heat. • Units of temperature. • Saturated vapour. • Superheated vapour. • Sub-cooled liquid. 2.12 Measure the temperature with	60 hrs	<ul style="list-style-type: none"> • Thermometer Celsius scale. • Thermometer Fahrenheit scale. • Calculator. • Teaching aids. 	Class room/worksh op/laboratory.

		<p>thermometer.</p> <p>2.13 Convert the Celsius scale to Fahrenheit scale</p>			
	2.2 Apply the heat measuring formulas.	<p>2.21 Use the heat measuring formulas.</p> <ul style="list-style-type: none"> • $SH = m \times c \times Td$ <p>Where: SH=Sensible heat in kj. m=Mass of substance in kg. c=Specific heat of substance in kj/kg.k Td=Temperature difference in Kelvin</p> <ul style="list-style-type: none"> • $LH = m \times \text{Latent heat of substance /Kg}$ <p>Where: LH= Latent heat in kj m= Mass of substance in kg</p>			
3. Measure the pressure and vacuum.	3.1 Understand the pressure	<p>3.11 Define the:-</p> <ul style="list-style-type: none"> • Pressure. • Atmospheric pressure. • Gauge pressure. • Absolute pressure. • Vacuum • Units of pressure 	60 hrs.	<ul style="list-style-type: none"> • Pressure measuring gauges of different scales. • Vacuum pump. 	Class room/workshop/laboratory.
	3.2 Demonstrate the pressure measurement	<p>3.21 Describe the types and function of pressure measuring gauges.</p> <p>3.22 Measure the pressure of a gas with the pressure gauge</p> <p>3.23 Measure the vacuum with vacuum gauge</p>			
4. Understand the pressure temperature relationship	<p>4.1 Have the concept about:</p> <ul style="list-style-type: none"> • Boiling point/Saturation temperature/Critical temperature. • Saturation/Critical pressure. 	<p>4.11 Define the:</p> <ul style="list-style-type: none"> • Boiling point/Saturation temperature/ Critical temperature. • Saturation/Critical pressure. 	60 hrs.	Saturation pressure-Temperature tables for different refrigerants.	Class room/workshop/laboratory.

	4.2 Demonstrate the effect of pressure on boiling point.	4.12 Use the saturation pressure – temperature tables.			
5. Understand the psychrometry	5.1 Describe and find out the psychrometric properties of air	5.11 Define psychrometry. 5.12 Identification of lines and scale on a psychrometric chart. <ul style="list-style-type: none"> • Dry bulb temperature • Wet bulb temperature • Dew point temperature • Humidity ratio • Relative humidity • Enthalpy • Specific volume 5.13 Tracing air conditioning process on psychrometric chart <ul style="list-style-type: none"> • Sensible cooling • Sensible heating • Humidification • Dehumidification • Cooling with dehumidification • Heating with humidification 	60 hrs.	Psychrometric chart	Class room/workshop/laboratory.

Module 2: Basic Electricity

Objective of the Module: To introduce the candidate to:

- Electrical Principles.
- Electrical circuits.
- Electrical Components.

Duration: 300 hours **Theory:** 60 hours **Practice:** 240 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Have basic concept about the principles of electricity	1.1 Understand and describe the principles of electricity	1.11 Explain the structure of atom and how it relates to electricity 1.12 Describe the action of a magnetic field. 1.13 Summarize how an electrical current will produce magnetism 1.14 Define the law of opposite and like charges. 1.15 Explain how a magnetic field can be used to produce electricity. 1.16 Describe the component of a simple electrical circuit. 1.17 Define “voltage”, “current” and “resistance”. 1.18 Define “conductor”, “resistor” and “insulator”. 1.19 Compare DC and AC current. 1.110 Compare a simple water circuit with an electric circuit.	100 hrs.	<ul style="list-style-type: none"> • Teaching aids. • Models etc. 	Class room/Workshop/Laboratory.
2. Sketch out the electrical circuits	2.1 Identify, draw and understand the electrical circuits.	2.11 Draw a series circuit. 2.12 Draw a parallel circuit. 2.13 Draw a series-parallel circuit. 2.14 Explain the operating characteristics of series and parallel circuits. 2.15 Describe a frame ground or one - wire circuit.	100 hrs.	<ul style="list-style-type: none"> • Drawing material. • Stationery • Teaching aids. • Calculator 	Class room/Workshop/Laboratory.

		2.16	Recognize typical electrical and electronics symbols.			
	2.2 Apply Ohm's Law	2.21	Define Ohm's law.			
		2.22	Summarize the effects of voltage and resistance on current.			
		2.23	Calculate an unknown circuit value using Ohm's law.			
		2.24	List the rules of series and parallel circuits as related to Ohm's law.			
3. Prepare electrical circuits with different components.	3.1 Demonstrate an understanding of the electrical components.	3.11	Identify and explain electrical components. <ul style="list-style-type: none"> • Resistors. • Batteries. • Control Switches. • Capacitors. • Fuses. • Circuit breakers. • Indication lights. • Coils. • Transformers. • Relays. • Buzzer. • Solenoids. 	100 hrs.	<ul style="list-style-type: none"> • Electrical components. • Wires. • Tool kit. 	Class room/Work shop/Laboratory.
	3.2 Use the electrical components in electrical circuits properly.	3.21	Understand the function of electrical components.			
		3.22	Check the rating of electrical components.			
		3.23	Prepare the electrical circuits using different electrical components.			

Module 3:Tools/Equipment, System components and Materials.

Objective of the Module:To enable the trainees to:

- Identify select,use and store the basic Basic hand tools/equipment.
- Identify and understand the function of different auto mobile air conditioning system components.

Duration:400 hours **Theory:** 80 hours **Practice:**320hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Identify, select and use the basic and special auto mobile air conditioning Tools and Equipment.	1.1 Use and application of basic hand tools/equipment.	1.11 Describe the use and application basic hand tools/equipment: <ul style="list-style-type: none"> • Screw drivers-Philips head, flat head. • Spanners-Open end, ring end. • Pliers-Combination, Nose, Grip • Vernier Caliper. • Micrometer. • Tube Cutter • Pipe Bender • Flaring Tool Set • Hacksaw. • Hammer • Mallet • Allen key • Screw wrench • Side cutter • Socket set • Ratchet wrench • Drill machine. • Personal safety clothing. • Fire Extinguisher. 	50 hrs	Basic hand tools and equipment: Special purpose tools, equipment and materials	Class room/works hop/laboratory.
	1.2 Use and application of special purpose tools, equipment and materials.	1.21 Describe the use and application of special purpose tools, equipment and materials needed for system recovery, vacuum, recharging, flushing (if applicable), service and maintenance of Auto Mobile Air Conditioning systems.			

		<ul style="list-style-type: none"> • Refrigerant identifiers. • Refrigerant recovery unit. • Service couplings and hoses. • Manifold gauge set. • Vacuum pump. • Lubricant oil injector. • Refrigerant charging unit. • Temperature measuring equipment. • Leak detectors. <ul style="list-style-type: none"> ➢ Visual (oil trace and bubble spray). ➢ Electronic. • Belt tensioning gauge. • Air flow meters. • Refrigerant flushing equipment. • Workshop safety precautions-personal, tools and equipment. 			
2. Identify and understand the function of Auto mobile air conditioning components.	2.1 Demonstrate an understanding of refrigerant circuit components.	2.11 Explain the function of : <ul style="list-style-type: none"> • TXV (Thermostatic Expansion Valve) • FOT (Fixed Orifice Tube). • Compressor. • Compressor clutch. • Condenser. • Evaporator. • Suction accumulator. • Receiver drier. • Pressure switches. • Thermostats. • Vacuum Switch. • Fan speed controller. • Selector switches. • Damper motors. • Vibration eliminators. 	200 hrs	Refrigerant circuit components. Auto Mobile Air Conditioning and climate control components	Class room/workshop/laboratory.

	<p>2.2 Identify the general and climate control components and demonstrate their working principles.</p>	<p>2.21 Demonstrate in-depth knowledge of the purpose, construction, principles of operation, diagnosis, Dismantling, refitting and maintenance of Mobile Air Conditioning and climate control components:</p> <ul style="list-style-type: none"> • Compressor clutches - types and drives, alignment, electrical connections • Compressors – types, piston, axial, reciprocating, swash / wobble plate, radial, scroll, rotary vane, variable, piston, scroll, mounting, direct, ear, control devices, mechanical control valve, thermal switches, high pressure relief valves, super heat and thermal limiters, maintenance and repair, clutch air gap (adjustment), clutch removal and refitting, shaft seal replacement, hygroscopic, checking levels • Hoses and pipes – sizes, types of fittings, flare, o ring, block / pad, spring-lock, construction, materials, rubber, aluminum, steel • Service valves and ports - flare type, back seating valve, quick couplers • Condenser - purpose, construction and operation, tube and fin, serpentine, parallel flow, sub-cooled, fans, maintenance, inspection and cleaning • Dehydrators - purpose, construction and operation, receiver driers, accumulator, desiccant bag • Metering devices - purpose, construction and operation, thermal expansion valve, internally equalized, externally equalized, block, fixed orifice tube (FOT) • Evaporators - purpose, construction and operation, fin and tube, serpentine, plate and fin, maintenance, treatments (odor and bacterial), pollution/pollen filters 			
--	--	---	--	--	--

		<ul style="list-style-type: none"> • Electrical control devices - purpose, construction and operation, pressure switches, binary, trinary, clutch cycling, thermostats, electrical and mechanical • Retrofitting – procedures, effects on components, o rings, compressors, lubricants, hose and pipes, condensers, dehydrators and desiccant, metering devices, labeling, service ports, electrical control devices. • Sensors, actuators, valves and fans. • Typical path of conditioned air flow. • Heating system. 			
3. Identify, select and use the different Materials.	3.1 List out the different types of refrigerants and identify them.	3.11 Define the refrigerant. 3.12 List out the different refrigerants. 3.13 Identify different refrigerants	150 hrs	Refrigerant cylinders, Refrigerant identifier. Hoses, Pipes- aluminum, steel, Fittings, Lubricants.	Class room/works hop/laboratory.
	3.2 Describe the properties of refrigerants.	3.21 Describe the classification of refrigerants 3.22 List out the characteristics of a good refrigerant. 3.23 Explain the properties of R12 (CFC) and R134a (HFC).			
	3.3 Handle the refrigerants	3.31 Describe the safety procedure for handling and storing the refrigerants.			
	3.4 Know the legal and environmental implications.	3.41 Describe the legal and environmental issues regarding: <ul style="list-style-type: none"> • Environmental implications, ozone layer and global warming • Health and safety /environmental requirements for handling, storage and transportation of refrigerants • Ozone layer • Ozone depletion • Greenhouse effect • Climate change and global warming • Montreal protocol • Kyoto agreement. 			

	3.5 Demonstrate an understanding of hoses and pipes	3.51 Identify, select and use the hoses and pipes: <ul style="list-style-type: none"> • Hoses and pipes – sizes, types of fittings, flare, o ring, block / pad, spring-lock. • Construction, materials, rubber, aluminum, steel 			
	3.6 Understand the Lubrication	3.61 List out the types of lubricants. 3.62 Explain the viscosity 3.63 Describe the factors which affect the viscosity 3.64 Measure the quantity of lubricants			

Module 4: Workshop Practice.

Objective of the Module:To enable the trainee to complete the tasks of:

- System trouble shooting
- System Repairing.
- System servicing and maintenance.

Duration: 600 hours **Theory:**120 hours **Practice:**480 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
1. Carry out different practical tasks.	1.1 Understand and perform the trouble shooting, repairing/maintenance tasks of the auto mobile air conditioning system.	1.11 Demonstrate an understanding of the function, layout and operating principles of air conditioning systems, components, equipment, tools for system recovery, vacuum, recharging and flushing (if applicable) Mobile Air Conditioning systems, procedures required for service and general maintenance.	40 hrs	Basic and special purpose tools, equipment and material as described in each learning element.	Class room/workshop/laboratory.
		1.12 Demonstrate an understanding of the environmental implications, legal, equipment, procedures, Health and Safety requirements for storage, refrigerant identification, refrigerant recovery, system evacuation, adding oil refrigerant recharging, final leak detection, flushing (if applicable) and disposal refrigerants and components.	40 hrs		
		1.13 Demonstrate an understanding of refrigerant identification, initial system evaluation – testing, via pressure gauges, temperature, air distribution and speed. Recovery, vacuum check, leak detection, visual, electronic, oil injection/ charging for service, general maintenance and repair procedures for both thermal expansion valve or fixed orifice tube air conditioning systems.	40 hrs		
		1.14 Demonstrate an understanding of the function, layout and operating principles of Auto Mobile Air Conditioning Systems, components, equipment, tools, materials and procedures required for system diagnoses.	40 hrs		

		1.15 Demonstrate an understanding of the purpose, construction, principles of operation, diagnosis, dismantling, refitting and maintenance of Auto Mobile Air Conditioning components.	40 hrs		
		1.16 Diagnose faults via gauge pressure interpretation, system diagnostics and repair procedures for either Thermal Expansion Valve or Fixed Orifice Tube Auto Mobile Air Conditioning systems.	40 hrs		
		1.17 Demonstrate an understanding of Climate Control Systems, configurations, operations and components including diagnosis.	40 hrs		
		1.18 Demonstrate an understanding of the environmental implications, legal, equipment, procedures, Health and Safety requirements for storage, refrigerant identification, refrigerant recovery, system evacuation, adding oil, refrigerant recharging, final leak detection, flushing (if applicable) and disposal of Auto Mobile Air Conditioning refrigerants and components whilst diagnosing system.	40 hrs		
		1.19 Describe the methods of accessing the relevant data from the utilization of information sources: <ul style="list-style-type: none"> Describe the methods of accessing data - workshop manuals, manufacturers' data and information sheets, service schedules, parts lists, trade association check lists, legal and technical data reference books. State how to access data using – computers, microfiche. 	40 hrs		
		1.110 System diagnostics and repair procedures for both TXV(thermostatic Expansion Valve) and FOT(Fixed Orifice Tube) air conditioning systems: <ul style="list-style-type: none"> Fault finding via gauge pressure interpretation - TXV system (high pressure, low pressure), FOT system (high pressure, low pressure, compressor cycle times). System diagnostics (characteristic system faults) – situations, metering devices, thermal expansion valve, (TXV stuck in open position, TXV stuck in closed position), orifice tube, leaking, blocked. Control devices – thermostat, mechanical 			

		<p>problem, electrical problem, pressure switches (all types), malfunctions, refrigerant (undercharged system, overcharged system, moisture, air), refrigerant system restrictions (receiver drier, accumulator, blocked condenser), compressors (noisy, overcharged system, undercharged system, lack of lubrication, belt tension and condition, pulley alignment, mounting, damaged valves), reduced air flow (internal (interior , pollution / pollen filter, blocked evaporator, fan resistor), external (exterior - blocked condenser, faulty condenser fan), HVACs control mechanisms, recirculation flap, air distribution flaps, water valves, temperature control, water ingress (blocked or incorrectly routed evaporator drain tubes, HVACs casings), vehicle odors (evaporator, bacteria).</p>	40 hrs		
		<p>1.111 Describe the methods used to remove and replace air conditioning components – compressor, pipes and hoses, condenser, condenser fans, dehydrator, receiver drier, accumulator, metering devices, thermal expansion valve, fixed orifice tube, evaporator, control devices, pressure switches, thermostats, control valves.</p>	40 hrs		
		<p>1.112 Demonstrate in-depth knowledge of climate control systems, configurations, operations and components including diagnosis:</p> <ul style="list-style-type: none"> • Climate control – function, heat loads, comfort zone, pollution. • Climate control system configurations manual temperature control air distribution, temperature, air speed, recirculation, air conditioning, defrost / demist. 	40 hrs		

		<p>1.113 Understand the operational function of the climate control system:</p> <ul style="list-style-type: none"> • Manual temperature control - air distribution, windscreen, face, foot, rear temperature (heating, cooling), air speed (manual (stepped and variable), recirculation, manual operation air conditioning, mode (on / off), economy (ec), defrost / demist, manual. • Automatic temperature control - air distribution (windscreen, face, foot, rear), temperature (heating, cooling), air speed, manual (stepped and variable), automatic, recirculation, manual operation, automatic operation, pollution control, defrost/demist, air conditioning, mode (on/off, economy (ec), automatic (auto), rest), defrost / demist (manual, zoning), driver, passenger, rear, single evaporator, dual evaporator. 	40 hrs		
		<p>1.114 Identify and describe in-depth the operation, purpose, construction, removal, refitting of climate control system components:</p> <ul style="list-style-type: none"> • Control – temperature control units -manual input, output, automatic input, output. • Sensors (purpose, construction and operation) - in-vehicle temperature, ambient temperature, evaporator temperature, coolant temperature, Condenser inlet and outlet temperature, position (flaps and valves), air quality, vehicle speed, pressure switches, compressor (anti-lock). • Actuators(purpose, construction and operation)- mechanical, temperature blending, air distribution, fresh air/recirculation, idle up, electrical, temperature blending, air distribution, fresh air/recirculation, idle up. • Valves – water, single, dual, liquid refrigerant valve. • Blowers (fans), heater motor, condenser fan. 	40 hrs		

		<p>1.115 Describe how to prepare and use hand, special purpose tools, equipment and materials needed to evaluate, diagnose, remove and refit climate control system faults and components:</p> <ul style="list-style-type: none">• Diagnostic tools (Use of) – Multimeter, oscilloscope, fault codes, diagnostic (Self), code reader, break out box, manufacturer specific.			
--	--	---	--	--	--

Assessment

MODULE 1: Fundamentals of Air Conditioning

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
6. Have an introduction to air conditioning.	12 hrs	48 hrs	<ul style="list-style-type: none"> • Observation • Written questions • Oral questions 	<ul style="list-style-type: none"> • Practical task • Work sheet • Professional discussion 	
7. Measure the heat and temperature.	12 hrs	48 hrs			
8. Measure the pressure and vacuum.	12 hrs	48 hrs			
9. Understand the pressure temperature relationship	12 hrs	48 hrs			
10. Understand the psychrometry	12 hrs	48 hrs			

MODULE 2: Basic Electricity

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Have basic concept about the principles of electricity	20 hrs	80 hrs	<ul style="list-style-type: none"> • Observation • Written questions • Oral questions 	<ul style="list-style-type: none"> • Practical task • Work sheet • Professional discussion 	
2. Sketch out the electrical circuits	20 hrs	80 hrs			
3. Prepare electrical circuits with different components.	20 hrs	80 hrs			

MODULE 3: Tools/Equipment, System components and Materials

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Identify select and use the basic and special auto mobile air conditioning Tools and Equipment.	27 hrs	107 hrs	<ul style="list-style-type: none"> • Observation • Written questions • Oral questions 	<ul style="list-style-type: none"> • Practical task • Work sheet • Professional discussion 	
2. Identify and understand the function of Auto mobile air conditioning components.	27 hrs	107 hrs			
3. Identify, select and use the different Materials.	26 hrs	106 hrs			

MODULE 4: Workshop Practice

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
2. Carry out different practical tasks.	120 hrs	480 hrs	<ul style="list-style-type: none"> • Observation • Written questions • Oral questions 	<ul style="list-style-type: none"> • Practical task • Work sheet • Professional discussion 	

Curriculum Developers

Amjad Mehmood

Senior Instructor, Refrigeration and Air Conditioning,
Government Technical Training Institute, Mughalpura, Lahore, Punjab.

Naveed Abbas

Instructor, Refrigeration and Air Conditioning,
Government Technical Training Institute, Mughalpura, Lahore, Punjab.

National Curricula Review Committee Members

Rafique Ahmed Memon

Principal,
Vocational Training Centre, Naushahero Feroze, Sindh.

Mushtaq Ahmed

Instructor,
Vocational Training Centre, Naushahero Feroze, Sindh.

Muhammad Aslam Naik

Principal,
Vocational Training Institute, Kotli, AJK.

Shoaib Anwar

Chief Instructor, Refrigeration and Air Conditioning,
Technical Training Centre, Quetta, Balochistan.

Muhammad Haroon

Instructor, Refrigeration and Air Conditioning,
Government College of Technology, Railway Road Lahore Punjab