

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents/ Lesson Plan

Course Title: Auto Electrician

Duration: 03 Months (90 Days)

Credits Hrs: 240 Hrs

192Hrs(80%Practical)

48Hrs(20%Theory)

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1. Introduction

An **auto electrician** is a tradesman specializing in electrical wiring of motor vehicles. Auto electricians may be employed in the installation of new electrical components or the maintenance and repair of existing electrical components. Auto electricians specialize in cars and commercial vehicles. Auto electricians work in dealer workshops or in independent service centers, diagnosing and repairing a vehicle's electrical faults. As automotive systems increase in complexity and feature more electronic components and accessories, the role of auto electrician becomes more important. Experienced auto electricians might work as independent technicians, offering a specialist service to vehicle owners or service centers.

Scope

Autoelectricians work on all vehicle electrical systems and components, including ignition, fuel injection and engine management systems, braking, battery, wiring and charging systems, lighting and indicators. They must also be familiar with increasingly-sophisticated in-car entertainment systems, including radios and video players, cell phone, navigation and vehicle information systems.

Diagnosis

A key role for auto electricians is fault diagnosis. They meet vehicle owners to discuss problems and carry out tests to identify the problem. If a vehicle has starting problems, intermittent running faults or poor fuel consumption, they use specialist skills and tools to diagnose problems in the ignition, fuel injection and engine management systems. To diagnose a vehicle with braking problems that are not due to mechanical faults, auto electricians diagnose the anti-lock braking system. They also test the battery and charging systems to ensure that electrical components are receiving the correct voltage.

Lighting

Auto electricians test vehicle lighting systems to ensure they are operating correctly. They test headlight beam alignment and lighting intensity in line with specifications and make any necessary adjustments. They fit additional lighting components, such as fog lights or emergency lights, ensuring that they are correctly connected to the electrical system.

Repair

When they have identified the source of a problem, auto electricians estimate the cost of repairing or replacing faulty components. If they cannot repair expensive computerized components, such as engine management systems, they advise customers of the cost before ordering replacements. After replacement or repairs, they carry out further tests to ensure the vehicle is now operating correctly. To test the repair of running problems or braking faults, they may carry out tests on the road in addition to workshop tests.

Installation

Auto electricians install new electrical or electronic components or accessories for customers. They may replace an entertainment system, for example, with a newer version or install a GPS navigation system. If an owner plans to tow a trailer or motor home, the auto electrician might modify the vehicle's electrical system.

The Course

This course is for learners who want to gain knowledge and basic skills required in the job of an Auto Electrician - probably from a role where they work under supervision or independently. The qualifications are for learners who want to increase their skills and take on more

responsibility. Units in the qualification cover all areas of working in Auto Electrical Industry/Workshop, customer support. In particular, the learners will have acquired competencies to:

- Work effectively as Auto Electrician
- Maintain/Service/Repair Lighting System of Vehicles.
- Test and Recharge Battery.
- Service/Repair/Test Starting System of Auto Vehicles.
- Repair/Service/Test Charging System.
- Service/Replace Electrical Accessories.
- Maintain Safety during working.

Note: Teacher should tell the students about the Basic Electricity Fundamentals, Ignition System & EFI (Electronic Fuel Injection) as it is not defined in the course.

After completion of this course, learners will have the opportunities to pursue career opportunities into job roles such as Auto Electrician, Supervisors, Foreman in private workshop, Auto mobile manufacturing companies, Entrepreneurs, Govt. Vehicle maintenance workshops.

Trainees level:	Middle (Preferably Matric /TSC)
Min. Qualification of Teacher:	DAE/Two year's experience/G-1/Level-3 Certificate with two year's workplace experience
Medium of instruction:	English/Urdu/Local language
Sequence of modules:	Trainee must complete all the modules and implement the health and Safety Rules

Schedu led Weeks	Module Title	Days	Hours	Learning Units	Theory Hrs	Workplace Hrs	Home Assignment			
Week 1	Follow safety rules	Day1	Hour 1	Wear Working uniform	04	16	Task 1 Task 2 Task 3			
			Hour 2	Use Protective equipment						
			Hour 3	Use Protective equipment						
			Hour 4	Use Protective equipment						
		Day 2	Hour 1	Use Protective equipment						
			Hour 2	Deal with work Accidents and injuries						
			Hour 3	Deal with work Accidents and injuries						
			Hour 4	Use Special Safety Tools						
		Day 3	Hour 1	Use fire extinguisher						
			Hour 2	Use fire extinguisher						
			Hour 3	Check All around working Area for safe Work						
			Hour 4	Manage Tools for proper work						
	Day 4	Hour 1	Top up cells with distilled water							
	Testing &Recharging Battery									

			Hour 2	Recharge the battery			
			Hour 3	Recharge the battery			
			Hour 4	Recharge the battery			
		Day 5	Hour 1	Install the battery			
			Hour 2	Test the battery load			
			Hour 3	Test the battery load			
			Hour 4	Test the battery load			
Week 2	Servicing/repairing/testing starting system	Day1	Hour 1	Diagnoses fault in starting system	04	16	Task 4 Task 5 Task 6
			Hour 2	Diagnoses fault in starting system			
			Hour 3	Diagnoses fault in starting system			
			Hour 4	Diagnoses fault in starting system			
		Day 2	Hour 1	Repair& replace self starting motor			
			Hour 2	Repair& replace self starting motor			
			Hour 3	Repair& replace self starting motor			
			Hour 4	Repair& replace self starting motor			

Servicing/Repairing Lighting System	Day 3	Hour 1	Test self starting motor by Multi Meter/ Proper equipment			
		Hour 2	Test self starting motor by Multi Meter/ Proper equipment			
		Hour 3	Checkout the current tendency to accurate			
		Hour 4	Checkout the current tendency to accurate			
	Day 4	Hour 1	Test the performance of starting system			
		Hour 2	Test the performance of starting system in different speed condition			
		Hour 3	Checkout all the connections relating to starting motor			
		Hour 4	Checkout fuses/ relay box			
	Day 5	Hour 1	Checkout all the connections related to lighting system			
		Hour 2	Checkout all the connections related to lighting			

				system			
			Hour 3	Checkout indicator/ switches / lights			
			Hour 4	Checkout indicator/ switches / lights			
Week 3	Servicing/Repairing Lighting System	Day1	Hour 1	Replaces Fuses/ Connectors	04	16	Task 7 Task 8 Task 9
			Hour 2	Replaces Fuses/ Connectors			
			Hour 3	Repair all light units			
			Hour 4	Repair all light units			
		Day 2	Hour 1	Repair of bulb holder and Replacement of Light Bulbs			
			Hour 2	Repair of bulb holder and Replacement of Light Bulbs			
			Hour 3	Checkout all indicators/light system connectivity			
			Hour 4	Checkout all indicators/light system connectivity			
		Day 3	Hour 1	Aligns Head Lights			

Servicing/replacing Horn System		Hour 2	Inspected all accessories/connections
		Hour 3	Checkout the functions of indicators & lighting systems
		Hour 4	Checkout the functions of indicators & lighting systems
	Day 4	Hour 1	Checkout the function of horn.
		Hour 2	Checkout all connections / fuses / relays related to horn system
		Hour 3	Checkout all connections / fuses / relays related to horn system
		Hour 4	Checkout all connections / fuses / relays related to horn system
	Day 5	Hour 1	Checkout horn button/steering knobs
		Hour 2	Checkout horn button/steering knobs

			Hour 3	Replace/service horn knobs/buttons			
			Hour 4	Refitted all the horn accessories & Checkout			
Week 4	Servicing/repairing/ testing charging system	Day1	Hour 1	Diagnoses faults in charging system	04	16	Task 10 Task 11 Task 12
			Hour 2	Diagnoses faults in charging system			
			Hour 3	Diagnoses faults in charging system			
			Hour 4	Diagnoses faults in charging system			
		Day 2	Hour 1	Repair Components of Alternator.			
			Hour 2	Repair Components of Alternator.			
			Hour 3	Repair Components of Alternator.			
			Hour 4	Repair Components of Alternator.			
		Day 3	Hour 1	Services of Alternator parts			
			Hour 2	Services of Alternator parts			
			Hour 3	Services of Alternator parts			

			Hour 4	Services of Alternator parts			
		Day 4	Hour 1	Assemble Alternator			
			Hour 2	Assemble Alternator			
			Hour 3	Assemble Alternator			
			Hour 4	Assemble alternator			
		Day 5	Hour 1	Checkout alternator fittings			
			Hour 2	Connect alternator to Engine assembly			
			Hour 3	Connect alternator to Engine assembly			
			Hour 4	Check out alternator built tension			
Week 5	Servicing/repairing/ testing charging system	Day1	Hour 1	Replace alternator relays in relay box	04	16	Task 13 Task 14 Task 15
			Hour 2	Replace alternator relays in relay box			
			Hour 3	Checkout electric connectivity by multi meter.			

			Hour 4	Checkout electric connectivity by multi meter			
		Day 2	Hour 1	Replace voltage regulator			
			Hour 2	Replace voltage regulator			
			Hour 3	Checkout regulator connectivity/ current			
			Hour 4	Checkout the static alternator test			
		Day 3	Hour 1	Examine the current conversion from DC to AC.			
			Hour 2	Examine the current conversion from DC to AC.			
			Hour 3	Checkout the current conversion in startup position			
			Hour 4	Checkout the current conversion in startup position			
		Day 4	Hour 1	Checkout the charging output of alternative to			

				the battery			
			Hour 2	Checkout the charging output of alternative to the battery			
			Hour 3	Checkout all the electric instruments related to alternator			
			Hour 4	Checkout all the electric instruments related to alternator			
		Day 5	Hour 1	Examine the flow of current by using multi meter			
			Hour 2	Examine the flow of current by using multi meter			
			Hour 3	Examine the function of rectifier by using multi meter			
			Hour 4	Examine the function of rectifier by using multi meter			

Week 6	Electric wind shield service/ repair	Day1	Hour 1	Checkout the wind shield wiper	04	16	Task 16 Task 17 Task 18
			Hour 2	Checkout the wind shield wiper			
			Hour 3	Disconnect the wind shield from the connector			
			Hour 4	Disconnect the wind shield from the connector			
		Day 2	Hour 1	Replace the wiper rubber both blades			
			Hour 2	Replace the wiper rubber both blades			
			Hour 3	Replace the wiper rubber both blades			
			Hour 4	Replace the wiper rubber both blades			
		Day 3	Hour 1	Refitted the wind shield assembly			
			Hour 2	Refitted the wind shield assembly			
			Hour 3	Checkout the water connection to the wind shield shower			
			Hour 4	Checkout the water connection to			

				the wind shield shower			
		Day 4	Hour 1	Replace the wind shield shower / hose			
			Hour 2	Replace the wind shield shower / hose			
			Hour 3	Replace the wind shield shower / hose			
			Hour 4	Replace the wind shield shower / hose			
		Day 5	Hour 1	Refitted the whole parts related to wind shield/ Wiper			
			Hour 2	Refitted the whole parts related to wind shield/ Wiper			
			Hour 3	Refitted the whole parts related to wind shield/ Wiper			
			Hour 4	Refitted the whole parts related to wind shield/ Wiper			
Week 7	Electric wind shield service/ repair	Day1	Hour 1	Refilled the wind shield bottle with fresh water	04	16	Task 19 Task 20 Task 21
			Hour 2	Check the leakage in all the wind shield system			

			Hour 3	Check the leakage in all the wind shield system			
			Hour 4	Check the leakage in all the wind shield system			
		Day 2	Hour 1	Checkout the wiper wind machine connections			
			Hour 2	Checkout the wiper wind machine connections			
			Hour 3	Checkout the current flow in both wind shield machines			
			Hour 4	Operate the wind shield machine by switching on the switch.			
		Day 3	Hour 1	Operate the wind shield machine by switching on the switch.			
			Hour 2	Checkout the wind shield wiper movement			
			Hour 3	Checkout the wind shield knob current flow			
			Hour 4	Checkout the function of the shower/blades			

		Day 4	Hour 1	Dismantle the wind shield motor knob connection to the steering			
			Hour 2	Dismantle the wind shield motor knob connection to the steering			
			Hour 3	Dismantle the wind shield motor knob connection to the steering			
			Hour 4	Dismantle the wind shield motor knob connection to the steering			
			Day 5	Hour 1	Examine the knob strips		
				Hour 2	Install new one		
				Hour 3	Refitted the knob to the steering Wheel		
				Hour 4	Assembled all the steering assembly & Checkout		
Week 8	Distributor Ignition System	Day1	Hour 1	Checkout the ignition circuit	04	16	Task22 Task23 Task24
			Hour 2	Checkout the ignition circuit			
			Hour 3	Checkout the ignition circuit			

			Hour 4	Checkout the ignition circuit			
		Day 2	Hour 1	Disconnect the ignition coil			
			Hour 2	Disconnect the ignition coil			
			Hour 3	Disconnect the ignition coil			
			Hour 4	Disconnect the ignition coil			
		Day 3	Hour 1	Test the ignition coil by using coil tester			
			Hour 2	Test the ignition coil by using coil tester			
			Hour 3	Test the ignition coil by using coil tester			
			Hour 4	Test the ignition coil by using coil tester			
		Day 4	Hour 1	Checkout the distributor high tension leads/ CB Point			
			Hour 2	Checkout the distributor high tension leads/ CB Point			

			Hour 3	Adjust CB point dwell angle			
			Hour 4	Adjust CB point dwell angle			
		Day 5	Hour 1	Replace sparking plugs to each cylinder			
			Hour 2	Replace sparking plugs to each cylinder			
			Hour 3	Check out all ignition system functions			
			Hour 4	Check out CB point dwell angle by tachometer			
Week 9	Magnetic ignition system	Day1	Hour 1	Checkout the ignition system components	04	16	Task25 Task 26 Task 27
			Hour 2	Checkout the ignition system components			
			Hour 3	Checkout magnetic distributor			
			Hour 4	Checkout magnetic distributor			
		Day 2	Hour 1	Replace the distributor magnetic / coil I .C			

			Hour 2	Replace the distributor magnetic / coil I .C			
			Hour 3	Replace the distributor magnetic / coil I .C			
			Hour 4	Replace the distributor magnetic / coil I .C			
		Day 3	Hour 1	Checkout the ignition coil(CDI) for each plug			
			Hour 2	Checkout the ignition coil(CDI) for each plug			
			Hour 3	Checkout the ignition coil(CDI) for each plug			
			Hour 4	Checkout the ignition coil(CDI) for each plug			
		Day 4	Hour 1	Checkout the distributor functions by using multi meter			
			Hour 2	Checkout the distributor functions by using multi meter			
			Hour 3	Checkout the distributor functions by			

				using multi meter			
			Hour 4	Checkout the distributor functions by using multi meter			
		Day 5	Hour 1	Checkout the sparking plug high tension lead			
			Hour 2	Checkout the sparking plug high tension lead			
			Hour 3	Examine the function of the ignition system			
			Hour 4	Examine the function of the ignition system			
Week 10	Set ignition timing	Day1	Hour 1	Started the Engine point out the ignition timing mark on flywheel	04	16	Task 28 Task 29 Task 30
			Hour 2	Started the Engine point out the ignition timing mark on flywheel			
			Hour 3	Adjust the specified time. By using timing gun / light			

			Hour 4	Adjust the specified time. By using timing gun / light			
		Day 2	Hour 1	Locate the fault in ignition system			
			Hour 2	Locate the fault in ignition system			
			Hour 3	Locate the fault in ignition system			
			Hour 4	Locate the fault in ignition system			
		Day 3	Hour 1	Loose the distributor to the connection			
			Hour 2	Turn to the left / right to the angle			
			Hour 3	Remove the distributor to the engine			
			Hour 4	Remove the distributor to the engine			
		Day 4	Hour 1	Adjust the valve timing to the timing belt / chain to the specified mark			

			Hour 2	Adjust the valve timing to the timing belt / chain to the specified mark			
			Hour 3	Adjust the valve timing to the timing belt / chain to the specified mark			
			Hour 4	Adjust the valve timing to the timing belt / chain to the specified mark			
		Day 5	Hour 1	Stable the static ignition timing by using ignition tester			
			Hour 2	Stable the static ignition timing by using ignition tester			
			Hour 3	Stable the static ignition timing by using ignition tester			
			Hour 4	Stable the static ignition timing by using ignition tester			
Week 11	Speedo meter / Oddo meter service setting	Day1	Hour 1	Switched ON ignition switch locate all accessories to the speed meter panel	04	16	Task 31 Task 32 Task 33

			Hour 2	Locate the fault in the speed meter			
			Hour 3	Locate the fault in the speed meter			
			Hour 4	Locate the fault in the speed meter			
		Day 2	Hour 1	Disconnect the speed meter to the Dashboard			
			Hour 2	Disconnect the speed meter to the Dashboard			
			Hour 3	Disconnect the speed meter to the Dashboard			
			Hour 4	Disconnect the speed meter to the Dashboard			
		Day 3	Hour 1	Service the speed meter			
			Hour 2	Service the speed meter			
			Hour 3	Service the speed meter			
			Hour 4	Service the speed meter			
		Day 4	Hour 1	Checkout / replace all lamps in speed meter			

			Hour 2	Checkout / replace all lamps in speed meter			
			Hour 3	Checkout all accessories connections in speed meter by using multi meter			
			Hour 4	Checkout all accessories connections in speed meter by using multi meter			
		Day 5	Hour 1	Check out the all the connections current flow from the speed meter to all the electric accessories			
			Hour 2	Check out the all the connections current flow from the speed meter to all the electric accessories			
			Hour 3	Refitted the speed meter to the dash board and check the test			
			Hour 4	Refitted the speed meter			

				to the dash board and check the test			
Week 12	Four Doors / Trunk connections	Day1	Hour 1	Diagnose fault in doors electric circuit / panel	04	16	Task 34 Task 35 Task 36
			Hour 2	Diagnose fault in doors electric circuit / panel			
			Hour 3	Diagnose fault in doors electric circuit / panel			
			Hour 4	Diagnose fault in doors electric circuit / panel			
		Day 2	Hour 1	Dismantle doors sheet to locate wind shield motor			
			Hour 2	Dismantle doors sheet to locate wind shield motor			
			Hour 3	Dismantle doors sheet to locate wind shield motor			
			Hour 4	Dismantle doors sheet to locate wind shield motor			
		Day 3	Hour 1	Replace wind shield doors motors			
			Hour 2	Replace wind shield doors motors			
			Hour 3	Replace wind shield doors			

				motors			
			Hour 4	Replace wind shield doors motors			
		Day 4	Hour 1	Checkout the movement of the wind shield mirror rack assembly			
			Hour 2	Checkout the movement of the wind shield mirror rack assembly			
			Hour 3	Replace the all racks to the doors			
			Hour 4	Replace the all racks to the doors			
		Day 5	Hour 1	Refitted all the parts to the door			
			Hour 2	Refitted all the parts to the door			
			Hour 3	Examine all electric accessories			
			Hour 4	Examine all electric accessories			

Workplace/Institute Ethics Guide

Work ethic is a standard of conduct and values for job performance. The modern definition of what constitutes good work ethics often varies. Different businesses have different expectations. Work ethic is a belief that hard work and diligence have a moral benefit and an inherent ability, virtue, or value to strengthen character and individual abilities. It is a set of values-centered on the importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for student success:

1. Attendance:

Be at work every day possible, plan your absences don't abuse leave time. Be punctual every day.

2. Character:

Honesty is the single most important factor having a direct bearing on the final success of an individual, corporation, or product. Complete assigned tasks correctly and promptly. Look to improve your skills.

3. Team Work:

The ability to get along with others including those you don't necessarily like. The ability to carry your weight and help others who are struggling. Recognize when to speak up with an idea and when to compromise by blend ideas together.

4. Appearance:

Dress for success set your best foot forward, personal hygiene, good manner, remember that the first impression of who you are can last a lifetime

5. Attitude:

Listen to suggestions and be positive, accept responsibility. If you make a mistake, admit it. Values workplace safety rules and precautions for personal and co-worker safety. Avoids unnecessary risks. Willing to learn new processes, systems, and procedures in light of changing responsibilities.

6. Productivity:

Do the work correctly, quality and timelines are prized. Get along with fellows, cooperation is the key to productivity. Help out whenever asked, do extra without being asked. Take pride in your work, do things the best you know-how. Eagerly focuses energy on accomplishing tasks, also referred to as demonstrating ownership. Takes pride in work.

7. Organizational Skills:

Make an effort to improve, learn ways to better yourself. Time management; utilize time and resources to get the most out of both. Take an appropriate approach to social interactions at work. Maintains focus on work responsibilities.

8. Communication:

Written communication, being able to correctly write reports and memos.
Verbal communications, being able to communicate one on one or to a group.

9. Cooperation:

Follow institute rules and regulations, learn and follow expectations. Get along with fellows, cooperation is the key to productivity. Able to welcome and adapt to changing work situations and the application of new or different skills.

10. Respect:

Work hard, work to the best of your ability. Carry out orders, do what's asked the first time. Show respect, accept, and acknowledge an individual's talents and knowledge. Respects diversity in the workplace, including showing due respect for different perspectives, opinions, and suggestions.

5. List of Tools, Machinery & Equipment

30.	Electricaltest bench	03
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Sr. No.	Name of Item/Equipment/Tools	Qty.
1.	HydroMeter	05
2.	Alternatorregulatortester	05
3.	Distributortester	05
4.	Clamponmeter(Digital)	05
5.	Tachometer	05
6.	Sparkplugtesterandcleaner	05
7.	Highbatedischargetester	05
8.	Multimeter(Digital&Analog)	05
9.	Scanner	03
10.	Shopfloorcleaner	02
11.	Micrometer	03
12.	S.S.T(SpecialServeTool)	03
13.	Flaringtool	05
14.	TubeCutter	05
15.	Air compressor	03
16.	Trolleyjack	03
17.	Safetystand	03
18.	Cleaninggun	02
19.	Oil gun	03
20.	Batteryalyzer	02
21.	Acmanifoldorrefrigerantfillingmachine	02
22.	Carwashingmachine	01
23.	Wetanddryvacuumcleaner	02
24.	Sparkplugcleaner&tester	03
25.	Electricdrillmachine	02
26.	Weldingmachine	01
27.	Brazing&solderinggun	05
28.	Growler	03
29.	Batterycharger	03

31.	Carstereo	02
32.	Wipermotorassembly	02
33.	TorqueWrench	02
34.	Airfillinggaugue	02
35.	RingSpanner Set	03
36.	ScrewDriverSet	05
37.	Test Lamp	05
38.	Headlightalignmentequipment	02
39.	Hammer	05
40.	WireStripper	05
41.	SolderingIron	05
42.	Thermometer	10
43.	DwellAngleMeter	03
44.	CondenserTester	03
45.	BearingPuller	03
46.	MiniHydraulicPressMachine	01
47.	Longnosepliers	20
48.	Sidecutter	20
49.	VenireCaliper	05
50.	Grippliers	10
51.	Injectortester	03
52.	Mallet	05
53.	AllenKeyset	05
54.	Combinationpliers	20
55.	PressureTester	05

5. List of Consumable Supplies

Sr. No.	NameofConsumableSupplies
1.	Harnesswire
2.	DistilledWater
3.	SulphuricAcid
4.	Grease
5.	Cottonrags
6.	Bulbs
7.	Sockets
8.	Fuses
9.	Oil
10.	SparkPlugs/GlowPlugs
11.	BatteryCells
12.	Motor Parts
13.	Relays
14.	Keroseneoil
15.	Brushes
16.	Bearing
17.	Switches
18.	batteryTerminals
19.	Solderingwire
20.	Flux
21.	Capacitor
22.	Battery12volt
23.	Carbonbrushes
24.	Packingkit/sealkit
25.	Timingseal
26.	Insulationtape
27.	Emery paper
28.	Shellac
29.	Distributorcoil
30.	C.B Point
31.	Fusebox
32.	Ignitioncoil
33.	Ignitionswitch
34.	Hornrelay
35.	Relay
37.	Distributorcables