GOVERNMENT OF THE PUNJAB

TECHNICAL EDUCATION & VOCATIONAL TRAINING AUTHORITY

Auto Electrician

(12SAUTE2019R2)

1-Year Course

(Revised, Aug 2019)

APPROVED
Date: 30-8-2019
Sign:

CURRICULUM SECTION
ACADEMICS DEPARTMENT
96-H, GULBERG-II, LAHORE
Ph # 042-99263055-9, 99263064
gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

TRAINING OBJECTIVES:

Due to popularity of automobiles, the need for skilled technician has increased and this is the age of specialization, because of the rapid changes in models every year and introduction of electronics requires such person as auto electricians who has the basic concept of theory and can apply his knowledge in practice

During the revision of this course topics regarding newer system as EFI electronic ignition, ABS and air conditioning have been introduced so that the trainee / initial learner may not face any problem in the field

This curriculum covers the auto mobile topics of scientific terms, principles, function, construction and operation of system / parts versions types, and troubleshooting along with ethical values enabling the passouts of this course to meet the requirements of job market demand.

CURRICULUM SALIENTS

Entry-level	Matric
Duration of course	1-Year (2-Semesters)
Training Hours	1600-Hours
	800 hrs / semester
	40-Hours / Week
	7 Hours per day (Friday 5 Hours)
Training methodology	Practical 80%
	Theory 20%
Instructional Media	Urdu / English

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SKILL PROFICIENCY DETAILS: -

On successful completion of this course, the trainee should be able to:-

1. Use the hand tools, measuring tools, electrical tools, accordingly and safely.
2. Check & maintain the battery.
3. Inspect, Dismantle, Assemble and performance check of self starts
4. Inspect, Dismantle, assemble and output check of alternator.
5. Make the wiring of Various system of vehicle
6. Check and troubleshot the components of EFI
7. Inspect and troubles shoot the HVAC system of vehicle.

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KNOWLEDGE PROFICIENCY DETAILS

On successful completion of this course, the trainee should be able to:-

1. Explain the electricity and electronics, various terms relevant to this trade
2. Explain the purpose, function, construction and operation of battery.
3. Describe the purpose, function, construction and operation of self starter.
4. Describe the purpose, function, construction and operation of alternators.
5. Define the purpose, function, constrain, operation and types of voltage regulations.
6. Define the purpose, function construction, operation and types of ignition system.
7. Explain the purpose, function, construction, operation of various electrical components used in a car as horn, lights, wind shield wipers, meters and gauges etc.
8. Explain the operation of EFIC electric and fuel injection circuit.
9. Explain the operation of electronic ignition.
10. Describe the operation of air conditioners in vehicle.

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CURRICULUM DELIVERY STRUCTURE

1ST SEMESTER

	Course Delivery	Co Curricula Activities / Vacations	Test	Total
Week	1-20	21-25	26	26
	20	5	1	

2ND SEMESTER

	Course Delivery	Co Curricula Activities / Vacations	Final Test	Total
Week	1-20	21-25	26	26
	20	5	1	

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SCHEME OF STUDIES

Auto Electrician

(1 – Year Course)

1ST SEMESTER

Sr. No.	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Workshop Practice	28	125	153
2.	Internal Combustion Engine	2	15	16
3.	Basic Electricity/Electronics	24	100	124
4.	Storage Battery	8	20	108
5.	Self-Starter	14	100	35
6.	Ignition System	17	160	177
7.	Technical Drawing-I	20	40	60
8.	Technical Mathematics-I	20	40	60
9.	Industrial tour	7	0	7
10.	Functional English	0	40	40
11.	Work Ethics	20	0	20
Total		**160**	**640**	**800**

2ND SEMESTER

Sr. No	Main Topics	Theory Hours	Practical Hours	Total
1	Charging Circuit/ Voltage Regulator	10	60	70
2	Wiring Circuits & Accessories	45	230	275
3	Electronically Controlled vehicle systems and sensors	30	203	233
4	Heating, Ventilating and Air Conditioning system.	15	100	115
5	Technical Drawing-II	20	0	20
6	Technical Mathematics-II	20	0	20
7	Industrial tour	0	7	7
8	Functional English	0	40	40
9	Work Ethics	20	0	20
Total		**160**	**640**	**800**

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DETAIL OF COURSE CONTENTS

Auto Electrician
(1-Year Course)

1st Semester

Sr. No.	Detail of Topics	Theory Hours	Practical Hours
1.	**Workshop Practice** 1.1. Safety precautions 1.2. Use of PPEs 1.3. Causes of fire and types of fire 1.4. Firefighting techniques 1.5. Occupational health and first aid 1.6. Introduction of trade tools , Machinery & Equipment 1.6.1. Different type of pliers and cutters 1.6.2. Different types of screw drivers and wrenches 1.6.3. Fasteners (Permanent and Temporary) 1.6.4. Purpose and working of Fitting tools 1.6.5. Multimeter 1.6.6. Hydro meter 1.6.7. Teco meter 1.6.8. Oscilloscope 1.6.9. Smoke tester 1.6.10. Feeler gauge 1.6.11. Spark plug cleaner 1.6.12. Battery load tester 1.7. Measuring and tools used in measuring 1.7.1. Measuring tape 1.7.2. Vertical venire 1.7.3. Head light Aim tester 1.8. Marking 1.9. Cleaning tools 1.9.1. Contact cleaner 1.9.2. Rust remover 1.9.3. Hot water treatment 1.9.4. Carb cleaner 1.9.5. Multipurpose lubricant 1.10. Fitting tools	28	125
2.	**Internal combustion engine** 2.1. Introduction to Internal combustion 2.2. Types of IC Engine 2.3. Major Parts and components of IC engine 2.4. Systems of engine 2.5. Difference between Spark ignition and Compression ignition engine	2	15

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3.	**Basic Electricity / Electronics** 3.1. Application of electricity 3.1.1. Atomic structure of matter and electricity 3.1.2. Conductor, insulator, semi conductor 3.1.3. Diodes and transistors 3.1.4. Current, voltage and resistance 3.1.5. Ohm's law 3.1.6. Magnet and magnetism 3.1.7. Left hand rule, electromagnet 3.2. Components of electrical circuits 3.2.1. Resistances and their coding, Relays, solenoid, printed, circuits, circuit breaker, fuse, types of bulb and lamps, timers, terminals and switches. 3.2.2. Series and parallel circuits 3.2.3. Combined series & Parallel circuits and their characteristics 3.2.4. Ampere meter and volt meter in circuits 3.3. Integrated circuits, Capacitors, diodes, transistors 3.4. Interpretation of circuit diagram (EWD) 3.5. Instrument cluster gauges and meters	24	100
4.	**Storage Battery** 4.1. Purpose and types of battery 4.2. Construction and identification of battery parts 4.3. Electrolyte and its characteristics 4.4. Charging and discharging of battery 4.5. Battery rating 4.6. Usage of Battery charger (fast and slow charging) 4.7. Battery tester (reading magnet eye) 4.8. Use of jumper cables 4.9. Types of storage batteries 4.9.1. Lead acid 4.9.2. Lithium ion 4.9.3. Nickel Cadmium 4.9.4. Nickel-Metal Hydride	8	20
5.	**Self-Starter** 5.1. Self-starter & its components 5.1.1. Purpose and Principle of self-starter 5.1.2. Construction and Function of self-starter 5.1.3. Neutral safety switch 5.1.4. Remote switch 5.1.5. Applied brake start system	14	100
6.	**Ignition System** 6.1. Purpose 6.2. Principal 6.3. Types of ignition systems	17	160

	6.3.1. Magneto ignition system 6.3.2. Capacitor discharge ignition 6.3.3. Mechanically timed ignition 6.3.4. Single coil and Multi coil ignition 6.3.5. Cross fire (Spark waste) ignition 6.3.6. Distributer type ignition system 6.3.7. Distributor less ignition 6.3.8. Electronic Ignition and digital electronic ignition system 6.3.9. High energy ignition 6.3.10. Hall effect ignition 6.3.11. Electronic Diesel fuel ignition (EDFI) 6.4. Construction and components of ignitions systems 6.5. Spark plug and its types 6.6. Glow plug and their function		
7.	**Technical Drawing – I** 7.1. Lines, lettering, dimensioning 7.2. Identification of Electrical symbols 7.3. Series and parallel and combined circuits 7.4. Drawing of radiator fan circuit of car 7.5. Drawing of wind screen wiper circuit of car 7.6. Drawing of Magnet ignition (Circuit completion) 7.7. Drawing of Battery coil ignition (Circuit completion) 7.8. Drawing of Horn circuit 7.9. Drawing of Head lamp and parking light circuit 7.10. Drawing of Indicator circuit 7.11. Drawing of Wiper motor circuit 7.12. Drawing of Door and roof light circuit 7.13. Drawing of Charging circuit (with electronic regulator) 7.14. Drawing of capacitor discharge ignition system of car 7.15. Reading circuit diagrams of different cars from manual	20	40
8.	**Technical Mathematics – I** 8.1. Simple addition, subtraction, 8.2. multiplication and division 8.3. Conversion of fraction to decimals 8.4. Percentage 8.5. Square and under root	20	40
9.	**Industrial tour**	7	0
	Total	**140**	**600**

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LIST OF PRACTICALS

1ST SEMESTER

1. Inspect the battery to find any leakage or damages.
2. Perform Volt meter test with appropriate tool and diagnose faults in voltages.
3. Perform Hydrometer test to check gravity of battery and diagnose faults.
4. Perform load test to check the load performance of battery and diagnose faults.
5. Check the battery indicator (magic eye) for the condition of battery electrolyte and diagnose faults.
6. Refill the battery with electrolyte according to standard level.
7. Clean the corroded terminals and poles according to set standard.
8. Charge the battery with charger according to set standards.
9. Inspect the charging system light, abnormal noise and conditions of drive belt to diagnose faults.
10. Check voltage of starting system with Digital Multi Meter (DMM) and compare it with set standards and diagnose faults.
11. Inspect physically and repair/ replace wiring harness of charging system in case of any fault.
12. Adjust or replace drive belt according to manufacturer's specifications.
13. Replace faulty alternator according to set standards.
14. Check and replace Ignition switch, ignition coil and resistor to ensure specified function in case of any fault.
15. Check high tension cables for damage insulation, continuity/resistance and replace faulty cables.
16. Check electric power source and charging system of the vehicle for specified functionality and diagnose faults.
17. Replace, clean and adjust spark plugs according to set standards.
18. Replace faulty fuses with correct ratings.
19. Check Distributor, Distributor cap and Router and replace faulty parts.
20. Check Ignition System Sensors and replace faulty Sensor.
21. Check battery condition with appropriate tools and diagnose faults.
22. Check starter motor for loose, corroded or broken connections or grinding noise when start.
23. Check solenoid relay and fuses with appropriate tools and replace faulty parts.
24. Check slipping/damage teeth of pinion and fly wheel and replace faulty parts.
25. Replace/Repair faulty Starter Motor.
26. Check all relays and fuses of lighting system and replace faulty parts.

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2ND SEMESTER

Sr. No.	Detail of Topics	Theory Hours	Practical Hours
1.	**Charging Circuit / Voltage Regulators** 1.1. Charging Systems 1.1.1. Purpose 1.1.2. Construction and operation of double point voltage regulator 1.1.3. Type of voltage regulator 1.1.4. Electronic regulators 1.2. Alternator 1.2.1. Purpose and Principle of Alternator 1.2.2. Construction and Function of Alternator	10	60
2.	**Wiring Circuits and Accessories** 2.1. Construction of circuits 2.1.1. Horn circuit 2.1.2. Head lamps circuit, other lights 2.1.3. Directional signal circuit 2.1.4. Roof light circuit 2.1.5. High low beam circuit 2.1.6. Wind shield wipers/washers circuit 2.1.7. Power windows circuit 2.1.8. Radiator fan circuit 2.1.9. Cigrate lighter circuit 2.1.10. multimedia control circuits 2.1.11. Sun roof circuit 2.1.12. Panoramic roof circuit 2.1.13. Auto light control circuits 2.1.14. Indicator light circuit 2.1.15. Auto side view mirror close circuit 2.1.16. Fog light circuit 2.1.17. Parking light circuit 2.1.18. Electric power steering circuit 2.1.19. Electronic power steering column control circuit (tilt and telescopic) 2.1.20. Electric seat adjustment circuit 2.1.21. Seat heating and ventilation circuit 2.1.22. Seat massager circuit 2.1.23. Service interval reset system 2.1.24. Sun wiser light circuit 2.1.25. Soft top convertible circuit 2.1.26. Hard top convertible circuit 2.1.27. Door soft closing circuit 2.1.28. Electric trank lid open circuit 2.1.29. Electric fuel tank filling cap opener circuit	45	230

	2.1.30. Heating and ventilating circuit 2.1.31. Defogger circuit 2.1.32. Side view mirror control circuit 2.1.33. Fuel system circuit 2.1.34. Engine fan circuit 2.2. interpretation of signs and symbols of instrument panel indicators		
3.	**Electronically Controlled vehicle systems and sensors** 3.1. Purpose, construction and working of microprocessors and integrated circuit 3.2. EFI Components and their working (microprocessor, sensors and actuators) 3.2.1. Oxygen sensor 3.2.2. Knock Sensor variable valve lift (VVI) cam sensor (VVTI) actuator 3.2.3. Manifold Absolute Pressure (MAP) Sensor 3.2.4. Mass Air Flow (MAF) sensor 3.2.5. Throttle Position (TP) sensor 3.2.6. Accelerator paddle position sensor 3.2.7. Body accelerator sensor 3.2.8. Lateral Acceleration sensor 3.2.9. Deceleration sensor 3.2.10. Cam position sensor 3.2.11. Crank Position sensor 3.2.12. Oil pressure sensor 3.3. Fuel level sensor 3.4. Fuel pump (primary & secondary) sensor 3.5. Fuel injectors (actuators) 3.6. Electric Secondary air injection pump 3.7. Coolant temperature sensor 3.8. Coolant level sensor 3.9. Electric coolant flow system 3.10. Electric coolant flow valve control (Thermostat) 3.11. Electronic Engine suction fan 3.12. Engine fan speed control module 3.13. Braking system 3.13.1. Brake fluid level sensor 3.13.2. Brake fluid pressure sensor 3.13.3. Brake paddle travel sensor 3.13.4. Brake booster vacuum sensor 3.13.5. Electronic brake force distribution system 3.13.6. Anti-lock brake(skidding) system 3.13.7. Senstronic brake control system 3.13.8. Electric wedge brake system (EWB) 3.13.9. Electric Brake hold system	30	203

	3.13.10. Electric brake force distribution (EBD) system 3.13.11. Brake assist(extra force apply) system 3.13.12. Regenerative brake system 3.13.13. Brake wear indication system 3.14. Catalytic convertor temperature sensor 3.15. Turbo boost pressure sensor 3.16. Intake Air Temperature (IAT) sensor 3.17. Rain sensor 3.18. Curb height control sensor 3.19. Wheel Speed Sensor 3.20. Fuel tank filling lock system 3.21. Keyless entry system 3.22. Keyless start (Push start) system 3.23. Basic of key programing 3.24. Auto wiper system 3.25. Auto light system 3.26. Rear window power sunshade 3.27. Overhead control panel 3.28. Active distronic system 3.29. Interior illumination system 3.30. Night vision display system 3.31. Safety and security 3.31.1. SRS air bag 3.31.2. Electronic battery safety terminals 3.31.3. Child lock system 3.31.4. Center locking system (Electric center locking .vacuum center locking) 3.31.5. Navigation system 3.31.6. Electric lid (Bonnet & Trunk) and door operating system 3.31.7. Tyre pressure monitoring system 3.31.8. Radar system 3.31.9. Vehicle immobilizer system 3.31.10. Vehicle tracking system 3.32. Drive assist systems 3.32.1. Auto start , stop system 3.32.2. Lane keeping assist system 3.32.3. Electric stability control system 3.32.4. Electric stability program system 3.32.5. Remote parking , auto parking system 3.32.6. Eco Idle drive system 3.32.7. Sports drive system 3.32.8. Active speed limit control system 3.32.9. Drive mode control system 3.32.10. Speed command system 3.32.11. Auto pilot system		

	3.32.12. Triptronic system 3.32.13. Active blind spot assist system 3.32.14. Active steering system in sleep mode 3.32.15. Active lane change system 3.32.16. Active steering system in lane control 3.33. Automatic transmission controls 3.33.1. Traction control system 3.33.2. Dynamic drive control system 3.33.3. Adaptive dynamic drive control system 3.33.4. Cruise control system 3.33.5. Skid control system 3.33.6. Parktronic system 3.33.7. electronic control of Manual transmission 3.33.8. Automatic transmission system 3.33.9. CVT system 3.33.10. Dual clutch transmission system Hydromantic transmission system Transfer case system 3.33.11. 4x4 drives. X Drive electric control system 3.34. Suspension system 3.34.1. Electronic drive mode (soft hard drive)controlled circuits in Suspension system 3.34.2. Pneumatic suspension system 3.34.3. Hydraulic suspension system 3.34.4. Dynamic stability control system 3.35. Hybrid vehicles 3.35.1. Types of hybrid system 3.35.1.1. Parallel hybrid 3.35.1.2. Mild parallel hybrid 3.35.1.3. Power-split or series-parallel hybrid 3.35.1.4. Series hybrid 3.35.1.5. Plug-in hybrid electric vehicle (PHEV) 3.36. Introduction to alternative fuel and emission less vehicles 3.36.1. Compressed Natural Gas (CNG) 3.36.2. Liquefied Natural Gas (LNG) 3.36.3. Hydrogen 3.36.4. Ethanol Fuel 3.36.5. Electric vehicles & Solar energy cars 3.37. Usage of Diagnostic scanner 3.37.1. Fault diagnosing and interpreting codes 3.37.2. Electrical circuit checking and repairing 3.37.3. Trouble shooting of vehicle electrical		

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	system		
4.	**Heating, Ventilating and Air Conditioning system.** 4.1 Cooling system 4.1.1. Basic Function of HVAC system 4.1.2. Components of cooling system 4.1.3. AC cooling fan, 4.1.4. AC blower control regulator 4.1.5. Flab control motor 4.1.6. Condenser 4.1.7. Expansion valve 4.1.8. Evaporator coil 4.1.9. Thermostat 4.1.10. Ac and heater circuits 4.1.11. Construction and types of compressor 4.1.12. Types of refrigerants 4.1.13. Humidity sensor 4.1.14. Internal temperature sensor 4.1.15. Evaporator temperature sensor 4.1.16. Refrigerant temperature sensor 4.1.17. Refrigerant pressure sensor 4.1.18. Air control flab motors 4.2 Heating system 4.2.1. Components of heating system 4.2.2. Working of heating system 4.3 Auto temperature control of vehicle 4.4 Seat heating and cooling system 4.5 Cool box (fridge) system 4.6 Automatic climate control system 4.7 Side view mirror heating system 4.8 Wind screen and rear screen heating system 4.9 Steering heating system	15	100
5.	**Technical Drawing – II** 5.1. Drawing of auto start system of car 5.2. Drawing of engine control unit of car 5.3. Drawing of security system of car 5.4. Completing car wiring diagram 5.5. Drawing of key type & keyless entry system of car 5.6. Drawing of auto door lock system of car 5.7. Drawing of Anti-lock braking circuit 5.8. Drawing of Air conditioning circuit	20	
6.	**Technical Mathematics – II** 6.1. Area and circumference of circle, triangle, square, rectangle, trapezium and compound shapes. 6.2. Ohm's Law, drop voltage in Series and parallel circuit 6.3. Electrical work, electrical power and battery	20	

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	capacity		
7.	**Industrial tour**	7	0
Total		**140**	**600**

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LIST OF PRACTICALS

2nd SEMESTER

1. Check the headlights at high/ low beam, tail lights and replace faulty parts.
2. Check reverse lights and reverse gear switch and replace in case of any fault.
3. Check fog lights and replace in case of any fault.
4. Check roof and reading lights and replace in case of any fault.
5. Check break switch to verify flow of power supply and replace faulty parts.
6. Check turn signals (indicators) to verify flow of power supply and replace faulty parts.
7. Check parking/ instrument panel light bulbs and replace in case of any fault.
8. Check combination switch and replace damaged/faulty parts.
9. Carry out inspection of operation of cooling fan and repair the faults.
10. Carry out inspection of Water temperature gauge, and sensor/ switch and replace faulty parts.
11. Carry out inspection of cooling fan relay, fuse, and replace faulty parts.
12. Carry out inspection of wiring harness and repair/ replace faulty parts.
13. Check instrument panel visually to find any abnormality in gauges.
14. Verify the abnormal current flow or bad connection of gauges with the help of scanners and Multimeter.
15. Repair/ replace wiring harness or faulty parts.
16. Check instrument panel visually to find any abnormality in sensors.
17. Verify the abnormal current flow or bad connection of sensors with the help of scanners and Multimeter.
18. Repair/ replace wiring harness or faulty parts.
19. Check hoses connection and water circulation in HVAC heating system and repair any loose connection or replace damaged parts.
20. Check for any leakage or blockage in Vehicle HVAC System and replace faulty parts.
21. Check dumper and repair faulty parts to ensure stable operation of heating core.
22. Carry out inspection of blower motor and replace in case of any fault/s or irregularity.
23. Inspect switches, relays, fuses and wiring circuit and repair/ replace faulty parts.
24. Inspect Air conditioning system visually and replace manually damaged or leaking parts.
25. Use the AC Recycling Machine to check the refrigerant pressure in system and refill it with new refrigerant as per set standards.
26. Detect any abnormal noise from compressor and replace faulty parts.
27. Monitor air flow in the system and repair/ replace clogged or damaged parts.
28. Inspect switches, fuse and wiring circuit and repair/ replace faulty parts.
29. Inspect air flow in different modes of ventilation system and repair/replace in case of any fault.
30. Identify faults of electronic brake system using Scanner.
31. Inspect continuity of electricity in wire harness and diagnose faults.

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32. Identify faulty components of Brake System (sensors, modulator, etc.) to identify faults.
33. Check brake indicator switches to identify faults.Repair/ replace damaged wire harness according to set standards.
34. Replace faulty components of Brake System (sensors, modulator, etc.) according to SOPs
35. Perform road test to ensure the proper working of electronic brake system.
36. Carry out road test at different speeds for smooth operations of torque converter and gear shifting according to manufacturer standard.
37. Check electrical controls and Hydraulic pressure of automatic transmission for faults.
38. Check automatic transmission solenoid by using electronic scanner and identify faults.
39. Carryout vehicle road test of automatic transmission for engagement and disengagement, abnormal noise and vibrations.
40. Diagnose faults in EPS with the help of scanner and remove code.
41. Check and replace faulty fuse, relay and control module of EPS.
42. Check the motor of power steering (EPS) and replace faulty parts.
43. Check wiring harness to find cuts or damages and repair/ replace.
44. Check the functionality of fuses, relays, switches and replace faulty parts.
45. Monitor Current flow with Digital Multimeter and repair damage/s, as per set standard.
46. Check power window motor and observe any abnormal sound from doors and repair faulty parts.
47. Check visually cable/ gear driven regulators for any damages of power window and replace faulty parts.
48. Inspect sunroof operation and diagnose the fault.
49. Observe any abnormal sound during opening/ closing operation of sunroof and fix it according to manufacturer's specifications.
50. Check channel / track condition and service dirty parts.
51. Start the car to check for any failure and interpreter indication of instrument cluster
52. Troubleshoot electric steering malfunction
53. Find the failure with the help of scanner and fix the problem according to set standards.
54. Check the condition of receiver key and replace.
55. Check the battery of remote with the help of Multimeter and replace faulty parts.
56. Check fuse module and wiring circuit current flow and repair faulty parts.
57. Observe any abnormal noise from door lock actuators, find the fault and fix it according to set standards.
58. Check Supplemental Restraint System (SRS) system using Scanner.
59. Identify faulty components of Supplemental Restraint System (SRS) (Spiral cable, seatbelt, SRS unit, Control module, sensor, etc.) and replace faulty parts.
60. Inspect continuity of electricity in wire harness and repair/ replace faulty harness.
61. Check the Cruise Control System and diagnose fault with the help of scanner.

62. Check continuity of spiral cable, cruise switch, brake light switch, fuse and module with the help of Digital Multimeter (DMM) and replace faults.
63. Check wiring harness circuit, and repair/replace faulty harness.
64. Blown Wiper system fuse. Check and replace fuse.
65. Check lose wiper system electrical/ wiper motor connection and secure relevant connections.
66. Check and tighten disengaged or loose wiper motor linkage or replace new linkage fixings.
67. Check relay/ wiper motor and multi switch and renew relay, motor replace to test book to confirm fault and renew relay, wiper motor, multi switch.
68. Check the washer fluid reservoir for dirt / leakage and clean it well inside.
69. Look for cracks, leaks in the plastic or rubber hoses connected to the washer reservoir. Replace any faulty hoses.
70. Unclog dirt from nozzles, hoses or screens service with Use a long pin or fine wire to pick out or poke through clogged dirt.
71. Check operation of the seat in each direction of movement to verify the functionality of seats.
72. Inspect the fuse, wiring and remove/ replace faulty parts.
73. Inspect the power seat switches and remove/ replace the switch if faulty.
74. Check motor condition to ensure that the motor is not clogged with debris and replace faulty parts.
75. Blow the horn to check the functionality.
76. Check the fuse, relay and wiring circuit in case of no or low sound and replace faulty parts.
77. Check movements of mirrors in different directions to inspect the functionality of power mirrors.
78. Check fuse, circuit wiring and control switch of power mirrors and replace faulty parts.
79. Check for any hard sound deadening in all four doors and replace faulty parts.
80. Check the function of folding and replace non-functioning parts.
81. Check EFI system with the help of scanner to diagnose faults.
82. Check fuel pump pressure with the help of fuel pressure tester to verify the appropriate functioning and replace the faulty fuel pump as per given standards.
83. Check fuel injector resistance with the help of multi-meter to ensure standard operation and replace the faulty fuel injector as per given standards.
84. Identify the type of EGR value of your vehicle and remove fault.
85. Check Oxygen sensor with the help of scanner and replace in case of any fault.
86. Check wiring harness and repair/ replace faulty wire as per set standards.
87. Check and service EGR system in case of any contamination or clog as per set standards.
88. Inspect Oxygen sensor visually to check for any miss fire or damage.
89. Diagnose Oxygen sensor with the scanner to check for malfunction.
90. Inspect Oxygen sensor to ensure the clean emission of vehicle and replace in case of any fault.
91. Inspect Oxygen Sensor to check for any sluggish or slightly corroded sulphate and perform cleaning.

92. Check wiring harness of oxygen sensor and replace/ repair harness.
93. Troubleshot Check engine misfiring
94. Troubleshot engine over heating
95. Troubleshot engine under power
96. Analyze engine exhaust emission and Troubleshot accordingly
97. Troubleshot suspension system abnormal height
98. Troubleshot improper working of wind screen wiper
99. Troubleshot ABS system
100. Troubleshot malfunction of electric power assist steering

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LIST OF LABS

1. Auto Electrician & Electronics lab

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LIST OF MACHINERY / EQUIPMENT TOOLS ETC.

(For a class of 25 students)

Name of Trade	Auto Electrician
Duration	One-Year

Auto Electrician & Electronics lab

SR. NO.	EQUIPMENT / TOOLS	QUANTITY
1.	Air Compressor	100 liters single phase 5-7 hp
2.	Ac manifold or refrigerant filling machine	1 No.
3.	AC Compressor of different Vehicle	3 Nos.
4.	Adjustable wrenches (1", ½ ")	1 Nos. each
5.	Allen keys mm	1 Set
6.	Alternator output tester	1 No.
7.	Alternator regulator tester	1 No.
8.	Alternator test bench	1 No.
9.	Audio ac panel remove kit	1 No.
10.	Automobile emission tester	1 No.
11.	Ball peen hammer (250, grams)	1 Nos. each
12.	Battery 12 V, 200 amp	2 Nos.
13.	Battery analyzer	1 No.
14.	Battery charger 30 amp 6 - 24 volt	1 No.
15.	Battery load tester	1 No.
16.	Bench grinder	1 No.

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17.	Bench vices	5 Nos.
18.	Box end / off set ring spanner	1 Sets
19.	Brazing & soldering gun(45-75 watt)	25 Nos.
20.	Car door training model (driver side)	5 Nos.
21.	Car stereo	5 Nos.
22.	Circlip plier inner outer	1 Each
23.	Clamp on meter (Digital)	5 Nos.
24.	Combination plier	2 Nos.
25.	Combination wrenches	2 Sets
26.	Compression tester	2 Nos.
27.	Condenser tester	2 Nos.
28.	Coolant temperature Thermo meter	1 No.
29.	Creeps	2 Nos.
30.	Dashboard removing kit	1 No.
31.	Diagnostic Scanner	2 Nos.
32.	Distributor tester	2 Nos.
33.	Dwell Angle Meter	2 Nos.
34.	Electrical test bench	2 Nos.
35.	Emergency light head mounted	2 Nos.
36.	Feeler gauges	2 Nos.
37.	Flat files (simple and double cut)(12")	3 Each
38.	Fuse tester	2 Nos.
39.	Grip pliers 8"	5 Nos.
40.	Growler tester	2 Nos.
41.	Hammer (500 gm)	5 Nos.

42.	Head light alignment equipment	1 No.
43.	High rate discharge tester	1 No.
44.	Hydraulic jack Trolley type (2 ton)	2 Nos.
45.	Hydro Meter	25 Nos
46.	Ignition timing lights	1 No.
47.	Injector tester	2 Nos.
48.	Jumper cables	2 set
49.	Lock pliers (internal, external)	1 No. each
50.	Long noise pliers 8"	10 Nos.
51.	Mallet (500 gm)	2 Nos.
52.	Micrometer	5 Nos.
53.	Multimeter (Digital & Analog)	3 Each
54.	Open end wrenches 8", 6-32 mm jaw size	12
55.	Ring Spanner Set	1 set
56.	Round file fine	5 Nos.
57.	Safety goggles	5 Nos.
58.	Safety stand	1 Set
59.	Screw driver flat type 6 pcs	1 Set
60.	Screw driver Philips type 6 pcs	1 No.
61.	Side cutter	12 Nos.
62.	Socket sets	1 set
63.	Spark plug spanners 14 & 16, 17 & 19, 21 mm long socket	1 Each
64.	Spark plug tester and cleaner	1 No.
65.	Star key set	5 Nos.
66.	Starting system trainer test bench	1 No.

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67.	Steel foot rule	5 Nos.
68.	Tachometer	1 No.
69.	Test Lamp	5 Nos.
70.	Tube cutter	5 Nos.
71.	Tyre pressure gauge (digital, Analog)	2 each.
72.	Vernier Caliper	5 Nos.
73.	Wiper motor assembly	5 Nos.
74.	Wind shield wiper motor	5 Nos
75.	Wire Stripper	10 Nos.

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LIST OF CONSUMABLE
(For a class of 25 students)

S. No.	Consumable Items	Quantity
1.	Bio-Clean Ultrasonic Cleaning Fluid 5LT	5 Tin
2.	Alternator carbon brush	5 Set
3.	Auto bulb double point	1 Dozen
4.	Auto bulb single point	1 Dozen
5.	Battery terminals (heavy duty)	6 Pair
6.	Brushes	6 Nos.
7.	Bulb holder single & double point	6 No. each
8.	Bulbs	3 dozen
9.	C.B Point	2 Nos.
10.	Capacitor (1 to 10 F)	30 Nos of different capacity
11.	Carbon brushes	10 Nos.
12.	Combination switch	2 Nos.
13.	Condenser for relevant distributer	2 No.
14.	Cotton gloves	3 Dozen
15.	Cotton rags (cotton waste)	20 Kg
16.	Different electric & electronic components of car for demonstration & practice	As per requirement
17.	Distilled water	20 litters
18.	Distributor cables	2 Nos.
19.	Distributor coil	2 Nos.
20.	Emery paper	10 Nos.
21.	Flashers	5 Nos.
22.	Flowrite Cleaning and Flowing Fluid 5LT	3 bottles
23.	Flux (Soldering paste)	10 jars
24.	Car Fuse box	10 Nos
25.	Fuses Assorted Amps for car (5-20 Amp)	3 Packets
26.	Grease	1 KG
27.	Harness wire (3mm and 5mm)	5 role each

		different colors
28.	Head lamp blubs	10 Nos.
29.	Horn	5 Nos.
30.	Horn relay	10 Nos.
31.	Ignition coil	2 Nos.
32.	Ignition switch with key	5 Nos.
33.	Indicator switch	2 Nos.
34.	Insulation tape	2 Dozen
35.	Kerosene oil	3 liters
36.	Ordinary fasteners used in shop	As per requirement
37.	Packing kit/seal kit	As per requirement
38.	Petrol / Kerosene oil	5 liters
39.	Relay	10 Nos of different capacity
40.	Shellac	5 Tin
41.	Sockets	25 Nos.
42.	Solder wire 60/40	2 Roll
43.	Spark Plugs/Glow Plugs	8 Nos.
44.	Starter motor brush	5 Sets
45.	Sulphuric acid	2 Liters
46.	Switches	25 Nos.
47.	Thimbles male & Female	1 Packet each
48.	Timing seal	5 Nos.

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EMPLOYABILITY OF PASS-OUTS.

The pass outs of this course may find job / employment opportunities in the following sectors / areas: -

1. Auto Parts manufacturing industries.
2. Power generation, agriculture machinery, earth moving machinery firm.
3. Transport pool / Section of Govt. Department
4. Authorized sales / service dealers in automobile
5. Service Station
6. Private Workshops

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REFERENCE BOOKS

- Automotive Mechanics (11th Edition) By W.H. Crouse, Mc-Graw Hill Book Company
- Auto Electrician Training Manual For Short Course By TEVTA

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MINIMUM QUALIFICATION OF INSTRUCTOR

- BSc Agricultural Engineering with 01-year teaching / industrial experience

OR

- BS in automotive technology with 01-year teaching / industrial experience

OR

- D.A.E in Auto & Farm Technology with 03-years teaching / industrial experience

OR

- D.A.E in Auto & Diesel Technology with 03-years teaching / industrial experience

OR

- 02-year / G-II trade proficiency certificate in Auto & Diesel Mechanic with 06-years teaching / industrial experience

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CURRICULUM REVISION COMMITTEE

1.	**Engr. Atif Latif** Assistant Manager, R & D TEVTA Secretariat, Lahore.	**Convener**
2.	**Muhammad Zahid** Superior & Diagnoser, BOSCH Car Services, Gohawa Road off New Airport Road, Near Toyota Airport Motors, Bhatta Chowk, Lahore.	Member
3.	**Mr. Shaukat Ali Rana** Senior Instructor, GCT Railway Road Lahore.	Member

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