EUROPEAN UNION

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DEUTSCHE ZUSAMMENARBEIT

NORWEGIAN EMBASSY

Supported by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Islamic Republic of Pakistan
اسلامی جمہوریہ پاکستان
Islāmī Jumhūrī-ye Pākistān

NAVTTC

Published by
National Vocational and Technical Training Commission
Government of Pakistan

Headquarter
Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

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Layout & design
SAP Communications

Photo Credits
TVET Reform Support Programme

This document has been produced with the technical assistance of the TVET Reform Support Programme, which is funded by the European Union, the Embassy of the Kingdom of the Netherlands, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version
December, 2014
Islamabad, Pakistan


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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

Auto electricians work on all vehicle electrical systems and components, including ignition, fuel injection and engine management systems, anti-lock braking, battery, wiring and charging systems, heating and air conditioning 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.

Trainee entry 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 health and Safety Rules.

2. Overview of the Program

Module Title and Aim	Learning Units	Theory[1] hrs	Workplace[2] hrs	Timeframe of modules
Module: 1 Apply Safety Precautions and Guidelines at Workplace **Aim**: This module is designed to apply basic health and safety procedures at workplace by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify hazards in workplace, comply health and safety precautions, use of personal protective equipment and practicing safe work habits at workplace at all times.	**LU1**: Identify hazards in workplace environment **LU2**: Comply with basic Health and Safety Precautions. **LU3**: Apply Personal Protective and Safety Equipment **LU4**: Practice safe work habits to ensure safety at workplace.	30	80	Independent
Module: 2 Repair and Replace Lighting System of Vehicle **Aim**: This module is designed to repair lighting system of a vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify faults in different parts of the	**LU1** Diagnose Fault in Lighting System of the Vehicle **LU2**: Repair lighting system of the Vehicle **LU3**: Replace Fuses/Connectors of Lighting System. **LU4**: Repair Indicator Light Unit.	20	80	Independent

[1] Learning hours in training provider premises
[2] Training workshop, laboratory and on-the-job workplace

Module Title and Aim	Learning Units	Theory[1] hrs	Workplace[2] hrs	Timeframe of modules
lighting system of a vehicle and fixing the problems by repairing or replacing the faulted parts.	**LU5**: Replace Light Bulbs of the Vehicle **LU6**: Align the Head Lights of the Vehicle.			
Module: 3 Test Battery performance **Aim**: This module is designed to test the battery performance of a vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to apply different tests including inspection of electrolyte and terminals, measuring the specific gravity, checking the level of distilled water and recharging the battery in order to enhance the performance of the battery of the vehicle.	**LU1**: Remove Battery from the Vehicle **LU2**: Inspect Electrolyte and Terminals of Battery. **LU3**: Check the specific of Gravity of the Electrolytes **LU4**: Clean Terminals of Battery **LU5**: Top Up Battery Cells with Distilled Water. **LU6**: Recharge the Battery. **LU7**: Test Load of Battery. **LU8**: Install the Battery in the Vehicle.	26	104	Independent
Module: 4 Install and Repair Starting System of Vehicle **Aim**: This module is designed to Install and Repair Starting System of Vehicle by	**LU1.** Diagnoses fault in starting system **LU2:** Test self-starting motor **LU3:** Repair & replace self-starting motor	30	140	Independent

Module Title and Aim	Learning Units	Theory[1] hrs	Workplace[2] hrs	Timeframe of modules
Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify starting system's common problems and to figure out possible solutions, either by repairing or replacing the parts of the starting system of the vehicle.	**LU4.** Install the self-starting motor **LU5:** Repair injection pump and solenoids switch **LU6.** Service / replace spark plug / glow plug **LU7.** Test the performance of starting system			
Module: 5 Install and Repair Charging System of Vehicle **Aim**: This module is designed to install and Repair Charging System of Vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify charging system's common problems and to figure out possible solutions, either by repairing or replacing the parts of the charging system of the vehicle.	**LU1**: Diagnose Faults in Charging System of vehicle. **LU2**: Repair/Replace faulty Components **LU3**: Adjust Fan belt tension	40	110	Independent
Module: 6 Repair Electrical Accessories of Vehicle. **Aim**: This module is designed to Repair Electrical Accessories of Vehicle by Auto Electrician in accordance with the	**LU1**: Diagnose fault in Electrical accessories of vehicle. **LU2**: Repair /Replace Electrical Accessories in vehicle.	30	110	Independent

Module Title and Aim	Learning Units	Theory[1] hrs	Workplace[2] hrs	Timeframe of modules
organization's approved guidelines and procedures. Trainee will be expected to identify faults in the electrical accessories of vehicle and figure out possible solutions, either by repairing or replacing the parts according to the requirement.				

3. Teaching and Learning Guide for Auto Electrician

Module 3.1: Apply safety precautions and guidelines at workplace

Objective of the Module: This module is designed to apply basic health and safety procedures at workplace by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify hazards in workplace, comply health and safety precautions, use of personal protective equipment and practicing safe work habits at workplace at all times.

Duration: Total: **110** hours Theory: **30** hours Practice **80** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify hazards in workplace environment	**Trainee must be able to:** • Read and interpret work processes and procedures correctly to identify risk of hazards at workplace. • Recognize processes, tools, equipment and consumable materials that have the potential to cause harm. • Identify any potential hazards and take appropriate action to minimize the risk.	• Health and safety precautions of the company. • Techniques and methods to identify the risks of hazards at workplace. • Dealing with hazards to avoid any accident or injury. • Safety reporting procedures and documentation.	30 hrs	Health and safety manual.	Class Room/ Worksho p
LU2. Comply with Occupational Health and Safety Precautions	**Trainee must be able to:** • Work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines. • Identify health and safety hazards in	• Organizational health and safety procedures. • Health and safety risks that can arise as a result of accidents.	30 hrs	Safety shoes, Safety gloves,	Class room/ Work shop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	the workplace, so that the potential for personal injury, damage to equipment or the workplace is prevented, and corrective action is taken. • Deal with problems which are within control, and report to safety officer that cannot be resolved.	• Types of hazards that are most likely to cause harm to health and safety.		Safety goggles, Safety helmet, uniform, Fire extinguisher (powder/gas), Smoke alarm, First aid box	
LU3. **Apply Personal Protective and Safety Equipment**	**Trainee must be able to:** • Select personal protective equipment in terms of type and quantity according to work orders. • Wear, adjust, and maintain personal protective equipment to ensure correct fitness and optimum protection in compliance with company procedures. • Ensure personal protective equipment is cleaned and stored in proper place.	• Importance of using Personal Protective Equipment. • Types of PPE. • Protective clothing and equipment (PPE) to be worn and where it can be obtained. • Safely maintaining the PPEs.	25 hrs	Safety shoes, Safety gloves, Safety goggles, uniform Safety helmet	Class room/work shop
LU4. **Practice safe work habits to ensure safety at workplace**	**Trainee must be able to:** • Wear required clothing (not loose or torn), confine long hair, and remove jewelry in accordance with company	• Importance of safety at work and its implications.	25 hrs	Fire extinguisher	Class room/work shop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	procedures. • Apply work procedures and approaches that ensure personal safety as well as others safety. • Demonstrate good housekeeping in the workplace by cleaning up spills or leaks. • Keep work area clean and clear of obstructions, and storing tools or equipment, so that the potential for accident or injury is prevented. • Ensure tools or equipment are in place and available in proper place as per company procedures.	• Work safety procedures and guidelines. • Specific company procedures regarding workplace safety. • Recommended procedure for cleaning and storing of tools and equipment at workplace.		(powder/gas), Tool box, bins, Safety covers, First aid box, Safety equipment	

Module 3.2: **Repair and Replace Lighting System of Vehicle**

Objective of the Module: This module is designed to repair lighting system of a vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify faults in different parts of the lighting system of a vehicle and fixing the problems by repairing or replacing the faulted parts.

Duration: Total: **100** hours Theory: **20** hours Practice **80** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Diagnose Fault in Lighting System of the Vehicle.**	**Trainee Must be able to:** • Carry out tests to determine faults using proper tooling and techniques. • Adopt a method for testing systems and components without causing damage to them. • Identify faults and determine repair actions to client. • Carry out tests according to guidelines and organization's procedures/policies. • Follow Repair manual for diagnosing fault in lighting system	• Using multi-meter and test lamp. • Components and functions of lighting system. • Different types faults in lighting system of vehicles. • Techniques and procedures of diagnosing faults in lighting system. • Specific safety precautions and guidelines. • Reporting procedures of faults and possible repair actions. • Guidelines, procedures and policies of the organization. • Read and interpret repair manual.	15 hrs	Multi-meter, Test lamp Cutter Pliers, repair manuals	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU2: **Repair lighting system of the Vehicle.**	**Trainee Must be able to:** • Select tools and equipment according to job requirement. • Repair faults in the components as diagnosed according to procedures. • Adopt a method for repairing systems and components without causing damage to them • inspect and verify the fault is removed • Observe occupational health and safety precautions at all times. • Follow Repair manual for repairing lighting system of the vehicle	• Use of multi-meter, test lamp and toolkit • Methods and procedures of repairing faults in the components (harness, switch) • Techniques for inspecting and verifying the repair of lighting system. • Specific safety precautions and guidelines. • Guidelines, procedures and policies of the organization. • Read and interpret repair manual.	20 hrs	Multi-meter, Test Lamp, Wire Insulating Tape, Cutter Pliers, screw drivers, spanners.	Class Room/ Work Shop.
LU3: **Replace Fuses/Connectors of Lighting System.**	**Trainee Must be able to:** • Select proper tools and equipment according to the job requirement • Follow the instructions of repair manual for the replacement of faulty fuses/connectors • Communicate to the client if the replacement of fuses/connectors is	• Use of multi-meter, test lamp, fuse puller and cutter pliers • Functions of fuses and connectors • Classification of fuses (e.g. 10 Amp, 20 Amp, 30 Amp etc) • Read and interpret repair manual.	20 hrs	Multi-meter, Test Lamp, fuse puller, screw driver, cutter pliers, insulation	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	required • Follow Repair manual for replacement of fuses/connectors • Observe occupational health and safety precautions at all times.	• Specific safety precautions and guidelines • Organizational standard operating procedures (SOPs)		tape	
LU4: **Repair Indicator Light Unit.**	**Trainee Must be able to:** • Select tools and equipment according to job requirement. • Repair faults in the components as diagnosed according to procedures. • Adopt a method for repairing indicator light unit without causing damage to it. • Inspect and verify the fault is removed • Observe occupational health and safety precautions at all times. • Follow Repair manual for repairing indicator light unit of the vehicle	• Use of multi-meter, Flats & Phillips Screw Drivers, Test Lamp, Amery Paper, spanner • Methods and procedures of repairing faults in indicator light unit • Techniques for inspecting and verifying the repair of indicator light unit • Specific safety precautions and guidelines. • Organizational standard operating procedures (SOPs) • Read and interpret repair manual.	15 hrs	Multi-meter, Flats & Phillips Screw Drivers, Test Lamp, spanner, Amery Paper (for cleaning rusted points).	Class Room/Work shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU5: **Replace Light Bulbs of the Vehicle.**	**Trainee Must be able to:** • Select proper tools and equipment according to the job requirement • Follow the instructions of repair manual for the replacement of faulted light bulbs • Communicate to the client if the replacement of light bulbs is required • Follow Repair manual for replacement of light bulbs • Observe occupational health and safety precautions at all times.	• Use of Phillips Type Screw Driver, Flat Type Screw Driver, spanner • Classification of bulbs (Volts and Watts) • Read and interpret repair manual. • Specific safety precautions and guidelines • Organizational standard operating procedures (SOPs)	15 hrs	Phillips Type Screw Driver, Flat Type Screw Driver, spanner	
LU6: **Allign the Head Lights of the Vehicle.**	**Trainee Must be able to:** • Select proper tools and equipment according to the repair manual • Adopt a method for adjusting head lights without causing damage to them • Inspect and verify the focus of head lights according to the repair manual • Observe occupational and machine	• Use of Phillips screw Driver, • Head light Aligner (Special Service Tools SST) • Read and interpret repair manual. • Techniques and procedure of using headlight aligner (SST) • Specific safety precautions and	15 hrs	Phillips screw Driver, Head light Aligner (SST), measuring tape	

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	safety at all times	guidelines • Organizational standard operating procedures (SOPs)			

Module 3.3: **Test Battery Performance**

Objective of the Module: This module is designed to test the battery performance of a vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to apply different tests including inspection of electrolyte and terminals, measuring the specific gravity, checking the level of distilled water and recharging the battery in order to enhance the performance of the battery of the vehicle.

Duration: Total: **130** hours Theory: **26** hours Practice **104** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. **Remove Battery from vehicle**	**Trainee should be able to:** • Select proper tools and equipment according to the repair manual • Adopt a proper method for removing battery from the vehicle using repair manual • Disconnect terminals of the battery carefully. • Observe occupational health and safety precautions at all the times.	• Use of Pliers and Ring Spanner • Read and interpret repair manual • Techniques for removing battery • Specific safety precautions and guidelines	12 hrs	Auto Electrical Tool Box , Screw driver set, pliers, open end spanner	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU2. **Diagnose Electrolytes and terminals of Batteries of the vehicles**	**Trainee should be able to:** • Select proper tools and equipment according to the repair manual • Adopt a proper method for inspecting battery electrolyte and terminals using repair manual • Report faults and possible solutions to client. • Observe occupational health and safety precautions at all the times.	• Use of Hydro meter and Battery Tester • Read and interpret repair manual • Techniques for inspecting and verifying faults in the battery • Standard gravity of electrolytes • Specific safety precautions and guidelines • organizational reporting procedures	14 hrs	Auto Electrical Tool Box , Multi meter , Batteries ,Vehicles test lamp ,distilled water , Hygrometer, Sulphric acid	Class Room/ Work Shop.
LU3: **Check the specific gravity**	**Trainee should be able to:** • Select proper tools and equipment according to the repair manual • Adopt a proper method for checking specific gravity of battery using repair manual • Observe occupational health and safety precautions at all the times.	• Use of Hydrometer • Standard gravity of electrolytes • Read and interpret repair manual • Personal health and safety measures	12 hrs	Auto Electrical Tool Box , Screw Drivers Hydro meter	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU4. **Clean battery terminals**	**Trainee should be able to:** • Select proper tools according to the repair manual • Adopt a proper technique for cleaning terminals • Observe personal health and safety at all times	• Use of contact Spray and Amery paper for cleaning • Read and interpret repair manual • Personal health and safety measures.	14 hrs	Auto Electrical Tool Box , Pliers , screw driver set, Open end Spanner	Class Room/Work shop.
LU5. **Top up cells with distilled water**	**Trainee should be able to:** • Adopt a proper method for topping up the battery cells with distilled water • Carry out top up according to the repair manual's guidelines • Observe personal health and safety at all times	• Use of hydrometer • Upper and lower levels of battery electrolytes. • Personal health and safety measures	16 hrs	Filler, distilled water	Class Room/Work shop.
LU6. **Recharge the battery**	**Trainee Must be able to:** • Select proper tools and equipment according to the job requirement • Select a proper method for recharging from the repair manual • Observe personal health and safety	• Techniques and procedures to use battery charger • Read and interpret repair manual • Personal and machine safety	18 hrs	Battery, multi meter , auto electric tool box , wires, battery charger, hydro	Class Room/Work shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	at all times • Set the amperes of tanger (Battery Charger) according to battery specifications • Connect battery terminals with the battery tanger/charger according to the procedure	• Procedures for setting the amperes of tanger • Method of connecting battery terminals with the tanger		meter, cell tester	
LU7. **Test the battery load**	**Trainee should be able to:** • Select proper tools and methods for calculated load of the battery • Test battery performance through battery analyzer. • Measure battery charging with the help of multi-meter to analyze the volts.	• Use of Battery analyzer and multi-meter • Method of calculating Battery load. • Values of Charge, recharge and discharge. • Personal health and safety measures	14 hrs	Battery, multi meter , auto electric tool box , wires , charger	Class Room/Work shop.
LU8. **Install the battery**	**Trainee should be able to:** • Wash Battery bracket and terminals to remove sulphur and rust • Re-assemble battery in bracket. • Install the positive (+) and negative	• Purpose of washing battery bracket and terminals • Procedure of installation of battery • Read and interpret repair	11 hrs	Battery, auto electric tool box , screw driver set	Class Room/Work shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	(-) terminals and tight the lead. • Follow repair manual's instructions for installation of battery • Start the car and check the performance.	manual			
LU9. **Replace the battery charging system**	**Trainee should be able to:** • Trouble shoot electric charging system and • Repair battery charging system • Replace battery charging system	• Battery charging system • Repair / replace battery charging system.	19 hrs	Battery, auto electric tool box , screw driver set, multi meter , test lamp, pliers	Class Room/Work shop.

Module 3.4: **install and Repair Starting System of Vehicle**

Objective of the Module: This module is designed to Install and Repair Starting System of Vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify starting system's common problems and to figure out possible solutions, either by repairing or replacing the parts of the starting system of the vehicle.

Duration: Total: **170** hours Theory: **30** hours Practice **140** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Diagnoses fault in starting system	**Trainee should be able to:** • Carry out tests on following to determine faults: 1. Glow Plug for diesel engine 2. Spark Plug for petrol engine 3. Ignition coil 4. Injection pump solenoid valve for diesel engine 5. Fuel pump and regulator valve 6. Contact and Breaker Point (CB) and Condenser • Using proper tooling and techniques for performing diagnostic tests. • Adopt a method for diagnosing	• Using multi-meter and test lamp. • Components and functions of lighting system. • Different types faults in lighting system of vehicles. • Techniques and procedures of diagnosing faults in lighting system. • Specific safety precautions and guidelines. • Reporting procedures of faults and possible repair actions. • Guidelines, procedures and policies of the organization. • Read and interpret repair manual.	35 hrs	Auto Electrical Tool Box , scanners, Screw driver set, pliers, open end spanner, Multi-meter, Oscilloscope	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	faults in starting system without causing damage to them. • Identify faults and determine repair actions to client. • Carry out tests according to guidelines and organization's procedures/policies. • Follow Repair manual for diagnosing fault in starting system • Check the cranking /self • Report the diagnose fault to the concerned department.				
LU2: **Test self-starting motor**	**Trainee should be able to:** • Follow Repair manual for diagnosing fault in starting system • Check the cranking /self • Report the diagnose fault to the concerned department.	• Performance test of starting motor. • Check starter current, draw tests, voltages drop test • Inspect and test starter relays and solenoids.	40 hrs	Auto Electrical Tool Box , Screw Drivers	Worksh op

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU3: **Repair & replace self-starting motor**	**Trainee should be able to:** • Select tools and equipment according to job requirement. • Repair faults in the starter motor, as diagnosed, according to procedures. • Adopt a method for repairing starter motor without causing damage • Inspect and verify the fault is removed • Observe occupational health and safety precautions at all times. • Follow Repair manual for repairing starter motor of the vehicle	• Use of toolkit and repair manual • Procedure of repairing faults in starter motor • Safety precautions for dismantling and assembling starter motor • Method of measuring resistance of starter motor components	26 hrs	Motor, Cables, Wires, Auto Electrical Tool Box, Multi meter, Batteries, Vehicles Test lamp, growler	Class Room/ Work Shop.
LU4. **Install the self starting motor**	**Trainee should be able to:** • Select relevant tools and methods for installation of starter motor in the vehicle. • Reconnect the wiring and connectors according to repair manual. • Tighten the bolts of starter motor to	• Procedure for installation of starter motor in the vehicle. • Guidelines and procedures of repair manual of vehicles. • Importance of tightening the bolts at specified torque. • Method of connecting wires carefully.	20 hrs	Auto Electrical Tool Box ,	Class Room/Workshop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	specified torque. • Ensure the fault is removed and starter motor is functioning properly.				
LU5: **Repair injection pump and solenoids switch**	**Trainee should be able to:** • Diagnose injection pump solenoids switch • Repair injection pump solenoids switch	• Function of injection pump solenoid switch and its checking procedure. • Check / test injection pump solenoid switch.	16 hrs	Tool kit complete	Class Room/Workshop.
LU6. **Service / replace spark plug / glow plug**	**Trainee should be able to:** • Inspect the spark plug • Service / replace spark plug	• Types of spark plug / glow plug. • Check / clean / replace the methods of spark plug / glow plug.	19 hrs	Battery, multi meter, auto electric tool box, wires, charger	Class Room/Workshop.
LU7. **Test the performance of starting system**	**Trainee should be able to:** • Perform the test of starting system • Report about the test to customer/supervisor	• Performance tests of starting system • Do the tests of starting system	14 hrs	Battery, multi meter, auto electric tool box, wires, pliers, screw driver	Class Room/Workshop.

Module 3.5: **Install and Repair Charging system of Vehicle**

Objective of the Module: This module is designed to install and Repair Charging System of Vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify charging system's common problems and to figure out possible solutions, either by repairing or replacing the parts of the charging system of the vehicle.

Duration: Total: **150** hours Theory: **40** hours Practice **110** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. **Diagnoses faults in charging system**	**Trainee should be able to:** • Carry out tests on following to determine faults: 1. Check battery warning light 2. Alternator output voltage and ampere 3. Check tension of belt • Use proper tooling and techniques to perform diagnostic tests. • Adopt a method for diagnosing faults in charging system without causing damage. • Identify faults and determine repair actions to relevant person. • Carry out tests according to guidelines and organization's	• Method of using multi-meter. • Components and functions of charging system of vehicle. • Different types faults in charging system of vehicles. • Techniques and procedures of diagnosing faults in charging system. • Specific safety precautions and guidelines. • Reporting procedures of faults and possible repair actions. • Guidelines, procedures and policies of the organization.	25 hrs	Auto Electrical Tool Box , Screw driver set, pliers, Multi meter, wires, battery, battery charger	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	procedures/policies. • Follow Repair manual for diagnosing fault in charging system • Report the diagnose fault to the concerned department.	• Read and interpret repair manual.			
LU2. **Repair faulty components of generator/alternator**	**Trainee should be able to:** • Perform repairing of generator • Report about the performance of generator	• Methods of removing alternator / generator. • Test of alternator parts, replace / repair damaged parts, cleaning and greasing the parts.	25 hrs	Auto Electrical Tool Box, Multi meter, Batteries, Vehicles Test lamp	Class Room/ Work Shop.
LU3. **Assemble generator / alternator**	**Trainee should be able to:** • Perform the task of assembling alternator in vehicle accordingly • Report about the performance of generator after assembling	• Assembling and Disassembling / of alternator / generator. • Refit and assemble the generator.	28 hrs	Auto Electrical Tool Box , Screw Drivers	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU4. **Replace electronic relay**	**Trainee should be able to:** • Select relevant tools and method for the job. • Follow repair manual in replacing the faulty electronics relay. • Dismantle electronics relay according to repair manual. • Replace faulty electronics relay according to procedure. • Assemble electronics relay according to repair manual.	• Method of using tools and equipment for replacing electronics relay. • Procedure of dismantling and assembling the electronics relay. • Procedure and methods for replacing electronics relay according to repair manual. • Safety precautions and guidelines.	24 hrs	Auto Electrical Tool Box , Pliers , screw drivers , starter	Class Room/ Worksh op.
LU5: **Adjust alternator belt tension**	**Trainee should be able to:** Adjust the alternator belt tension in vehicle	• Knowledge of types and application of fan belt and its checking / adjusting procedures • Knowledge of sizes of fan belt and its checking / adjusting procedures • Adjust the alternator belt.	20 hrs	Auto Electrical Tool Box , Pliers , screw drivers , starter	Class Room/ Worksh op.
LU6. **Replace voltage regulator (Rectifier Assembly)**	**Trainee should be able to:** • Select relevant tools and method for the job.	• Method of using tools and equipment for replacing voltage	28 hrs	Battery, multi meter, auto electric tool	Class Room/ Worksh

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	• Follow repair manual in replacing the faulty voltage regulator. • Dismantle voltage regulator according to repair manual. • Replace faulty voltage regulator according to procedure. • Assemble voltage regulator according to repair manual.	regulator. • Procedure of dismantling and assembling the voltage regulator. • Procedure and methods for replacing voltage regulator according to repair manual. • Safety precautions and guidelines.		box, wires	op.

Module 3.6: **Repair Electrical Accessories of Vehicle**

Objective of the Module: This module is designed to Repair Electrical Accessories of Vehicle by Auto Electrician in accordance with the organization's approved guidelines and procedures. Trainee will be expected to identify faults in the electrical accessories of vehicle and figure out possible solutions, either by repairing or replacing the parts according to the requirement.

Duration: Total: **140** hours Theory: **30**hours Practice **110** hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. **Diagnose fault in Electrical Accessories**	**Trainee should be able to:** • Carry out tests on following to determine faults: o Power Steering o Power Windows o Radio Antenna o Cigarette Lighter o Heating/Cooling System o Fog Lights o Defogger o Centre Door Locking System o Sun Roof o Wiper Motor o Horn o Navigation/stereo System • Use proper tooling and techniques to perform diagnostic tests. • Adopt a method for diagnosing faults in electrical accessories without causing	• Method of using multi-meter. • Components and functions of different electrical accessories in vehicle. • Types of faults in different electrical accessories in vehicle. • Techniques and procedures of diagnosing faults in electrical accessories. • Safety precautions and guidelines. • Reporting procedures of faults and possible repair actions. • Guidelines, procedures and	50 hrs	Auto Electrical Tool Box , Screw driver set, pliers, multi meter	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	damage. • Identify faults and determine repair actions to relevant person. • Carry out tests according to guidelines and organization's procedures / policies. • Follow Repair manual for diagnosing fault in accessories. • Report the diagnosed fault to the concerned department.	policies of the organization. • Read and interpret repair manual.			
LU2: **Repair & replace electrical accessories**	**Trainee should be able to:** • Select relevant tools and method for the job. • Follow repair manual in replacing or repairing the faulty electrical accessories in vehicle. • Dismantle electrical accessories from vehicle according to manufacturer's manual. • Replace faulty electrical accessories (defogger, wiper motor, radio antenna, motor of sun-roof, horn etc.) according	• Read and interpret repair manual and manufacturer's instructions. • Procedure of dismantling and assembling of electrical accessories from vehicle. • Procedures for replacing accessories (defogger, wiper motor, radio antenna, motor of sun-roof, horn etc.). • Procedure for repairing of accessories (air conditioner, power window, cigarette lighter, center door locking system,	60 hrs	Motor, Cables, Wires, Auto Electrical Tool Box, Multi meter, Batteries, Vehicles Test lamp, distilled water, hygrometer	Class Room/ Work Shop.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	to procedure. • Repair faulty electrical accessories (air conditioner, power window, cigarette lighter, center door locking system, navigation system etc.) according to procedure. • Check and verify the electrical accessory installed, after repairing or replacing, is functioning properly.	navigation system etc.). • Safety precautions and guidelines.			
LU3: **Ensure the operation of electrical accessories**	**Trainee should be able to:** • Check the proper operation of electrical accessories • Verify the proper operation of electrical accessories • Report about proper operations of electrical accessories to the customer/supervisor	• Basic electrical quantities, wiring and measurement of electrical quantities. • Use multi meter,(Digital Meter) verification of proper operation of electrical accessories according to the specifications.	30 hrs	Auto Electrical Tool Box , Screw Drivers , multi meter, wires, connectors , fuses , test lamp, bulbs	Class Room/Workshop.

2. Assessment Guidelines for Auto Electrician

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- to the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy.

Final assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance. Examples for direct assessment include:

- surprise quizzes, for example conduct small test on the fly
- Work performances, for example supervising the task given in the computer lab
- Demonstrations, for example demonstrating the use of a particular training tool in preparation for staff development
- Direct questioning, where the assessor would ask the student from the syllabus taught in the class room or lab
- Paper-based tests, such as multiple choice or short answer questions form taught material

Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly. Examples for indirect assessment of a captain include:

- Home Work, such as assignments are given to be completed from home
- Final project, at the end of each module; a project is given to check the progress of the trainee

In some cases, it may not even be guaranteed that the work products were produced by the person being assessed. Therefore, assessor must take necessary steps to stop such happening.

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Sessional assessment

The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The final theoretical assessment shall consist of one 3-hour paper. The paper shall include at least two extended answer questions. The remainder shall consist of half multiple choice and half short-answer questions.

For the final practical assessment, each student shall be assessed over a period of two days, with two 3-hour sessions on each day. This represents a total of four sessions totalling 12 hours of practical assessment for each student. During this period, each student must be assessed using practical lab assignment, depending on his or her circumstances.

Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules and practical assignments into a cohesive two-day final assessment programme. This should include a meeting with the assessors to discuss a standardised methodology for awarding marks.

Module 1: Follow safety rules

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates
1. Wear Working uniform	5	23	Direct observation of wearing work clothes properly.	Demonstration by trainee.	
2. Use Protective equipment	5	20	Direct Observation from Practical Demonstration of using protective equipment List the names of Protective equipment	Demonstration by trainee. Multiple choice Questions via-Voss.	

3. Deal with work accidents and injuries	5	25	Identify objects and situations which can be dangerous and may cause accidents.	Demontration by trainee. Short Question Answers.	
4. Use fire extinguisher	5	22	Direct Observation from Practical Demonstration of using fire extinguisher.	Demonstration by Trainee.	

Module 2: Servicing /Repairing Lighting System

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates
1. Replaces Fuses/ Connectors	5	10	Direct Observation from practical Demonstration of replacing of fuse connections.	Demonstration by trainee to replace the fuse connections	
2. Repair Indicator Light Unit.	6	25	Direct observation from practical Demonstration of repairing indicator light unit. List the names of bulbs	Demonstration by trainee of repairing indicating light Unit. Short Answer questions.	
3.Repair of bulb holder and Replacement of Light Bulbs	4	20	Describe how will they repair and replace light bulbs	Demonstration by Trainee	
4. Aligns Head Lights	5	25	Direct observation from practical Demonstration of alignment of Head Lights.	Demonstration by Trainee	

Module 3: Testing & Recharging Battery

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates

1. Remove Battery	4	8	Direct Observation from practical Demonstration of removing the battery from the vehicles. List the name of battery cells.	Demonstration by Trainee on Vehicle for removing of battery.	Class Room/ Work Shop.
2. Inspect electrolyte & terminals	2	12	Describe how they will determine and inspect the electrolyte & Terminals.	Demonstration by Trainee. Multiple Choice Questions.	
3. Check the specific gravity	2	10	Direct Observation from practical Demonstration of checking the specific gravity.	Illustrate specific gravity test by trainee.	
4. Clean battery terminals	2	12	Direct Observation of guiding trainee over battery.	Demonstration by trainee. Short Answer and Questions	
5. Top up cells with distilled water	4	12	Direct Observation from practical Demonstration of topping up cells with distils water.	Demonstration by Trainee on battery whilst being safety conscious.	
6. Recharge the battery	6	12	Describe how they will determine to replace the battery	Demonstration by trainee.	
7. Test the battery load	2	12	Direct observation from practical Demonstration of Testing the load of battery. List the different load categories.	Short Answer Questions.	
8. Install the battery	2	11	Direct observation of guiding the trainee of installation the battery.	Demonstration by Trainee.	
9. Repair & replace the battery charging	2	15	Direct observation from practical Demonstration of repairing replacing battery charging system. List the name of charging system.	Demonstration by Trainee.	

system					

Module 4: Servicing / repairing / testing starting system

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates
1. Diagnoses fault in starting system	3	25	Direct observation of guiding trainee over vehicle to diagnose faults in starting system.	Demonstration by trainee.	
2. Repair & replace self starting motor	4	25	Direct Observation from Practical Demonstration of repairing & replacement self starting motor.	Demonstration by trainee on starting motor.	
3. Test self starting motor	4	18	Direct Observation from Practical Demonstration of testing self starting motor.	Demonstration by trainee on starting motor.	
4. Install the self starting motor	4	20	Direct Observation of guiding trainee to install the self starting motor in vehicles.	Demonstration by trainee.	
5. Repair injection pump solenoids switch	5	17	Direct observation from practical demonstration of repairing injection pump solenoids switch.	Demonstration by trainee	
6. Service / replace spark plug / glow plug	4	20	Direct observation from practical demonstration of service /replace spark plug /glow plug.	Demonstration by trainee	
7. Test the performance of starting system	4	17	Direct observation of guiding the trainee of testing the performance of starting system.	Short questions Answers.	

Module 5: Servicing / repairing / testing charging system

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates
1. Diagnoses faults in charging system	4	12	Direct Observation from Practical Demonstration of Diagnosing the faults in charging system.	Demonstration by trainee.	
2. Repair components of Alternator.	4	14	Direct Observation from Practical Demonstration of repair components of Alternator. List the name of components of Alternator.	Demonstration by trainee. Short Answer Questions.	
3. Assemble alternator	14	24	Describe how they will assemble alternator.	Demonstration by trainee.	
4. Replace electronic relay	4	20	Direct Observation of guiding trainee of replacing the electronic relay.	Demonstration by trainee.	
5. Adjust Alternator belt tension	5	20	Direct Observation from Practical Demonstration of adjusting fan belt tension accordingly.	Demonstration by trainee on vehicles.	
6. Replace voltage regulator	4	25	Direct Observation from Practical Demonstration of replace voltage regulator accordingly.	Demonstration by trainee. Short Questions Answer.	

Module 6: Servicing / replacing electrical accessories

Learning Units	Theory hrs	Workplace hrs	Recommended formative assessment	Recommended methodology	Scheduled dates
1. Diagnoses fault in Electrical Accessories	10	35	Direct Observation from Practical Demonstration of Diagnosing the faults in Electrical Accessories.	Demonstration by trainee.	
2. Repair & replace electrical accessories	10	60	Direct Observation from Practical Demonstration of repair / replace electrical accessories.	Demonstration by trainee. Short Answer Questions.	
3. Ensure the operation of electrical accessories	6	19	Identify objects and situations which can create faults or creating obstacles in the operation of electrical accessories.	Multiple choice Questions.	

Assessment context:

Some modules of this course can be assessed in class rooms on the basis of mock Interview ,Written/Oral questioning, role plays ,brain storming sessions, Demonstration of practical skills or Direct observation and some can be assessed on job with vehicle or in a simulated environment.

Critical aspects:

- Communication tools
- careful handling of equipment
- safety of oneself and others
- courteousness with customers.
- Variety of information’s
- Workplace standards

Assessment condition:

- ✓ The learner will have an access to vehicle
- ✓ the learner will have access to all tools
- ✓ the learner will be permitted to refer to the course documents
- ✓ The learner will be required to communicate their answers to the assessor
- ✓ The learner will have an access to library books

5. List of Tools, Machinery & Equipment

Sr. No.	Name of Item/ Equipment / Tools	Qty.
1.	Hydro Meter	05
2.	Alternator regulator tester	05
3.	Distributor tester	05
4.	Clamp on meter (Digital)	05
5.	Tachometer	05
6.	Spark plug tester and cleaner	05
7.	High rate discharge tester	05
8.	Multi meter (Digital & Analog)	05
9.	Scanner	03
10.	Shop floor cleaner	02
11.	Micro meter	03
12.	S.S.T(Special Serve Tool)	03
13.	Flaring tool	05
14.	Tube cutter	05
15.	Air compressor	03
16.	Trolley jack	03
17.	Safety stand	03
18.	Cleaning gun	02
19.	Oil gun	03
20.	Battery analyzer	02
21.	Ac manifold or refrigerant filling machine	02
22.	Car washing machine	01
23.	Wet and dry vacuum cleaner	02
24.	Spark plug cleaner & tester	03
25.	Electric drill machine	02
26.	Welding machine	01
27.	Brazing & soldering gun	05
28.	Growler	03
29.	Battery charger	03
30.	Electrical test bench	03
31.	Car stereo	02

32.	Wiper motor assembly	02
33.	Torque Wrench	02
34.	Air filling gauge	02
35.	Ring Spanner Set	03
36.	Screw Driver Set	05
37.	Test Lamp	05
38.	Head light alignment equipment	02
39.	Hammer	05
40.	Wire Stripper	05
41.	Soldering Iron	05
42.	Thermo meter	10
43.	Dwell Angle Meter	03
44.	Condenser Tester	03
45.	Bearing Puller	03
46.	Mini Hydraulic Press Machine	01
47.	Long noise pliers	20
48.	Side cutter	20
49.	Venire Caliper	05
50.	Grip pliers	10
51.	Injector tester	03
52.	Mallet	05
53.	Allen Key set	05
54.	Combination pliers	20
55.	Pressure Tester	05

6. List of Consumable Supplies

Sr. No.	Name of Consumable Supplies
1.	Harness wire
2.	Distilled Water
3.	Sulphuric Acid
4.	Grease
5.	Cotton rags
6.	Bulbs
7.	Sockets
8.	Fuses
9.	Oil
10.	Spark Plugs/Glow Plugs
11.	Battery Cells
12.	Motor Parts
13.	Relays
14.	Kerosene oil
15.	Brushes
16.	Bearing
17.	Switches
18.	battery Terminals
19.	Soldering wire
20.	Flux
21	Capacitor
22	Battery 12 volt
23	Carbon brushes
24	Packing kit/seal kit
25	Timing seal
26	Insulation tape
27	Emery paper

28	Shellac
29	Distributor coil
30	C.B Point
31	Fuse box
32	Ignition coil
33	Ignition switch
34	Horn relay
35	Relay
37	Distributor cables

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