

GOVERNMENT OF THE PUNJAB

TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY



CURRICULUM FOR
AUTO ELECTRICIAN
(6 – Months Course)
Revised April 2017

CURRICULUM SECTION
ACADEMICS DEPARTMENT

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TRAINING OBJECTIVES

Today's Automotive technology is rapidly changing from mechanical to electronics, from analogue to digital and from carbureted to electronic fuel injectors. due to the competition and pressures to produce more efficient and economical vehicle's electronic systems which are not only efficient but also adhere to very significantly controlled toxic emissions.

Demand for the trained Auto Electricians is rising day by day. Because of more and more automobiles on the roads, and more important are the Hi-Tech changes especially as hybrid vehicles, advanced electronic ignition systems and many other drive assist programs.

In future qualified and trained persons capable of diagnosing the problems and remedying them will be required. 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 pass outs of this course to meet the requirements of job market demand.

CURRICULUM SALIENTS

Entry Level	Middle
Duration of Course	6 - Months
Total Training Hours	800 Contact Hours
Training Methodology	Practical 80%
	Theory 20%
Instructional Media	Urdu / English

SKILL PROFICIENCY DETAILS

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

1. Use Auto Electrician workshop tools and equipment efficiently
2. Perform simple auto electrician shop techniques as wiring up in series and parallel circuits, making tester, jumper wires, soldering, tapping, connecting thimble etc.
3. Perform Maintenance, charging and testing of batteries.
4. Diagnose and Servicing the self-starters.
5. Diagnose and Servicing the Charging system.
6. Interpret wiring diagrams of vehicles.
7. Wire up the electrical circuits.
8. Apply the diagnostic flowchart diagram properly

KNOWLEDGE PROFICIENCY DETAILS

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

1. Basics of auto electrician.
2. Usage of workshop tools.
3. Various electrical components, their location, operation, and function.
4. Function & operation of battery.
5. Construction and operation of self-starter.
6. Construction and operation of charging system.
7. Construction and operation of ignition system
8. Different circuits applied in a Car wiring.
9. The operation of EFI electronics
10. Air-conditioning system of vehicle
11. Gasoline vehicle diagnosing through digital scanner

SCHEME OF STUDIES**Auto Electrician
(6 – Months Course)**

S. No.	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Introduction to Auto electrician basics	51	90	141
2.	Starting System of vehicle	13	80	93
3.	Charging System of Vehicle	16	63	79
4.	Ignition system of vehicle	20	90	110
5.	Wiring circuits and accessories	18	91	121
6.	Vehicle air conditioning and heating system	12	80	92
7.	Hybrid & Electric Vehicle	6	50	56
8.	I.T Fundamentals	8	32	40
9.	Functional English	16	64	80
Total		160	640	800

DETAIL OF COURSE CONTENTS
Auto Electrician
 (6 – Months Course)

Sr. No.	Detail of Topics	Theory Hours	Practical Hours
1	<p>Introduction to Auto electrician basics</p> <p>1.1. Safety Precautions general and auto electrician shop Firefighting, First aid, Environmental protection, Reasons for workshop accidents Possible causes of accidents in workshop and their safety precautions</p> <p>1.2. Introduction to hand tools & equipment used in auto electrician.</p> <p>1.3. Measuring tools (vernier caliper , feeler gauge)</p> <p>1.4. Introduction to Auto motive four stroke engine</p> <p>1.5. Basic electricity. (Atomic structure of matter and electricity)</p> <p>1.6. Conductor, insulator, semi conductor</p> <p>1.7. Current, voltage and resistance</p> <p>1.8. Ohm's law</p> <p>1.9. Symbols used in electrical wiring</p> <p>1.10. Series and parallel circuits</p> <p>1.11. Electric circuit problems</p> <p>1.12. Magnet, magnetism and electromagnet</p> <p>1.13. Relays, solenoid, printed, circuits, circuit breaker, fuse, types of bulb, terminals and switches.</p> <p>1.14. Diodes and transistors</p> <p>1.15. PNP & NPN type semiconductor's</p> <p>1.16. Thermistor</p> <p>1.17. Logic Gates</p> <p>1.18. Sensors and actuators</p> <p>1.19. Purpose ,Construction and types of battery</p> <p>1.20. Charging and discharging of battery</p> <p>1.21. Battery rating</p> <p>Practical</p> <ul style="list-style-type: none"> • Use of fire extinguisher • Measurement with vernier caliper • Measurement with wire gauge • Soldering (eye joint, lap joint, T Joint) • Use of Multimeter • Crimp connecting • Making test lamp • Studying characteristics of magnets • Interpret wiring diagram and color coding • Making Series and parallel circuits • Check fuse, switch, diode, and transistor 	51	90

	<ul style="list-style-type: none"> • Prepare full wave rectifier • Make Different Logic gate circuits • Checking different ICs • Identify parts of four stroke engine Identification of battery parts • Cleaning and topping up • Checking specific gravity • Battery charging • Preparation of electrolyte • Light load test • Trouble shooting (under charging & overcharging) 		
2	<p>Starting System of Vehicle</p> <p>2.1. Describe the Purpose ,Principle and Construction of starter motor</p> <p>2.2. Operation of solenoid switch and motor</p> <p>2.3. Neutral safety switch</p> <p>Practical</p> <ul style="list-style-type: none"> • Wiring up starting circuit • Dismantling, checking of starter motor • Starter motor components, assembling, performance checking • Trouble shooting their possible causes and remedies of starting system 	13	80
3	<p>Charging system of Vehicle</p> <p>3.1. Purpose, circuit diagram and Function of Charging Systems</p> <p>3.2. Function, construction and operation of alternator</p> <p>3.3. Construction and operation of double point voltage regulator</p> <p>3.4. Electronic regulators</p> <p>Practical</p> <ul style="list-style-type: none"> • Wiring up Charging circuit on wiring board • Charging system inspection & diagnosing • Adjusting alternator belt tension • dismantling, checking and inspection, assembling, of Alternator • Checking output of alternator • Replacing carbon brush • Trouble shooting their possible causes and remedies of charging system 	16	63
4	<p>Ignition system of Vehicle</p> <p>4.1 Purpose & types of ignition system</p> <p>4.2 Construction of conventional ignition system</p> <p>4.3 (Ignition switch, Ignition coil, Distributor, Spark plug and its types)</p>	20	

	<p>4.4 Capacitor discharge ignition 4.5 Pickup coil type ignition 4.6 Multiple coil and distribute less ignition 4.7 Firing order 4.8 Ignition timing</p> <p>Practical</p> <ul style="list-style-type: none"> • Wiring of conventional ignition system • Replacing C.B points • Setting ignition timing • Use of timing light • Checking of ignition system • Components as ignition coil, • Condenser advance mechanism, • Servicing of spark plug • Checking & wiring up CDI system components • Trouble shooting their possible causes and remedies of ignition system 		90
5	<p>Wiring Circuits and Accessories</p> <p>5.1 Purpose and construction of Horn circuit, Head lamps circuit, other lights 5.2 Wind shield wipers/washers circuit 5.3 Power windows 5.4 Electric power steering 5.5 Instrument panel gauges, meters, indicators 5.6 Introduction to EFI system components (Sensors, ECM & Actuators) 5.7 Introduction to electronic engine controls</p> <p>Practical</p> <ul style="list-style-type: none"> • Wiring up Head lamp circuit • Replacing fuses, switches and blubs • Head lamp aiming • Wiring up Parking light circuit • Wiring up Indicator circuit & Hazard warning circuit • Wiring up Brake & backup light circuit • Wiring up Door and roof light circuit • Wiring up Horn circuit • Wiring up wind shield wiper and washer circuit • Glow plug circuit and checking • Wiring up gauge circuits (Fuel, Temperature, oil pressure) • Parts identification and finding resistance of EFI components • Removing & refitting of different sensors & vales used in EFI system • Dismantling, Servicing & Reassembling different sensors & valves of EFI System • Removing, Servicing & refitting EFI fuel feed pump • Fault diagnosing in EFI System of different 	18	91

	vehicles		
6	Vehicle air conditioning and heating system 6.1 Ventilating, Heating, Dehumidifying and Defrosting function of vehicle 6.2 Components & the working principle of Air conditioner(AC) 6.3 Working of thermostats switch & Compressor clutch of AC 6.4 Gas charging of compressor 6.5 Automatic temperature control 6.6 Trouble shooting its possible causes and their remedies of Heating system 6.7 Trouble shooting its possible causes and their remedies of Air conditioner Practical Removing inspecting & installation of AC compressor Servicing of Air conditioner Gas charging of Air conditioner Servicing of Vehicle Heater	12	80
7	Hybrid & Electric Vehicles 6.1 Introduction to hybrid and electric vehicles 6.2 Types of Hybrid systems 6.3 Degree of hybridization 6.4 Charging system & Hybrid vehicle drive train 6.5 Plug in hybrid and electric vehicles 6.6 EURO emission standards Practical <ul style="list-style-type: none"> • Parts identification of hybrid vehicle • Identification of hybrid vehicle electronic controls • Parts identification of electric vehicle 	6	50
Total		136	544

LIST OF PRACTICALS

1. Use of fire extinguisher
2. Measurement with vernier caliper
3. Measurement with wire gauge
4. Soldering (eye joint, lap joint, T Joint)
5. Use of Multimeter
6. Crimp connecting
7. Making test lamp
8. Studying characteristics of magnets
9. Interpret wiring diagram and color coding
10. Making Series and parallel circuits
11. Check fuse, switch, diode, and transistor
12. Prepare full wave rectifier
13. Make Different Logic gate circuits
14. Checking different ICs
15. Identify parts of four stroke engine
16. Wiring up starting circuit
17. Dismantling, checking of starter motor
18. Starter motor components, assembling, performance checking
19. Trouble shooting their possible causes and remedies of starting system
20. Wiring up Charging circuit on wiring board
21. Charging system inspection & diagnosing
22. Adjusting alternator belt tension
23. dismantling, checking and inspection, assembling, of Alternator
24. Checking output of alternator
25. Replacing carbon brush
26. Trouble shooting their possible causes and remedies of charging system
27. Wiring of conventional ignition system
28. Replacing C.B points
29. Setting ignition timing
30. Use of timing light
31. Checking of ignition system
32. Components as ignition coil,

33. Condenser advance mechanism,
34. Servicing of spark plug
35. Checking & wiring up CDI system components
36. Trouble shooting their possible causes and remedies of ignition system
37. Wiring up Head lamp circuit
38. Replacing fuses, switches and blubs
39. Head lamp aiming
40. Wiring up Parking light circuit
41. Wiring up Indicator circuit & Hazard warning circuit
42. Wiring up Brake & backup light circuit
43. Wiring up Door and roof light circuit
44. Wiring up Horn circuit
45. Wiring up wind shield wiper and washer circuit
46. Glow plug circuit and checking
47. Wiring up gauge circuits (Fuel, Temperature, oil pressure)
48. Parts identification and finding resistance of EFI components
49. Removing & refitting of different sensors & vales used in EFI system
50. Dismantling, Servicing & Reassembling different sensors & valves of EFI System
51. Removing, Servicing & refitting EFI fuel feed pump
52. Fault diagnosing in EFI System of different vehicles
53. Parts identification of hybrid vehicle and vehicle electronic controls
54. Removing inspecting & installation of AC compressor
55. Servicing of Air conditioner
56. Gas charging of Air conditioner
57. Servicing of Vehicle Heater

SCHEME OF STUDIES**I.T. Fundamentals**

S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Introduction to Computers	2	6	8
2.	Typing - Microsoft Word	4	14	18
3.	Internet & Electronic Mail	2	12	14
Total		8	32	40

DETAIL OF COURSE CONTENTS**I.T Fundamentals**

S. No	Detail of Topics	Theory Hours	Practical Hours
1	<p>Introduction to Computers</p> <p>1.1 What is a computer- Definition, functions and general features?</p> <p>1.2 What is Hardware –</p> <p>1.2.1 Computer parts and units</p> <p>1.2.1.1 Input Unit - Keyboard, Mouse etc.</p> <p>1.2.1.2 Central Processing Unit</p> <p>1.2.1.3 Output Unit</p> <p>1.3 What is Software –</p> <p>1.3.1 Electronic Parts of a Pc it is</p> <p>1.3.1.1 Software and Its types</p> <p>1.3.1.2 System Software, Application software and its functions</p> <p>1.4 Working with windows Operating System</p> <p>1.4.1 How does windows desktops work?</p> <p>1.4.2 Setting desktop, background and wall papers etc.</p> <p>1.4.3 Viewing directories – List of files and folders different styles.</p> <p>1.5 What are the Icons, Shortcuts and other graphic,</p> <p>1.5.1 How to see computer contents on different drives etc.</p> <p>1.5.2</p>	2	6
2	<p>Typing and Word processing (MS Word)</p> <p>2.1 Proper way of typing correct and speedy - getting familiar with the keys</p> <p>2.2 Where to type in computer? How to save a file? How to get it back? Where to find your saved work?</p> <p>2.3 Formatting in MS Word Bold, Italic, page setup, setting shades and colors.</p> <p>2.4 Working with saved work, opening and moving files.</p> <p>2.5 How to get it printed?</p>	4	14

3	Emailing and Internet Surfing	2	12
	3.1 How to go to Internet, what is required for an internet connection etc.		
	3.2 How to use email? How to search on web? Etc		
	3.3 How to make new email account, login and logout an email account etc.?		
	3.4 Downloading and uploading attachments etc.		
Total		8	32

LIST OF PRACTICALS
I.T Fundamentals

S. No.	Name of Practical
1.	Turn On/Off and setting of power supply
2.	Accessing The Desktop
3.	Using of Icons and Shortcuts
4.	Setting / customizing the desktop
5.	Viewing the contents of computer – Directory
6.	Setting the view of a folder
7.	Copying, Deleting and Moving Files in a folder
8.	Working with different Applications
9.	Opening MS Word for typing
10.	First lesson of Typing A S D F
11.	Second Lesson of typing J K L ;
12.	Third Lesson U I O P
13.	Fourth Lesson R E W Q
14.	Fifth Lesson N M , .
15.	Sixth Lesson V C X Z
16.	Seventh Lesson All letter using R index Finger
17.	Eighth Lesson All letter using L index Finger
18.	Formatting in MS Word Bold, Italic etc.
19.	Page Setting/ Page Layout
20.	Using Internet
21.	Opening Email, making new account
22.	Sending Receiving Emails
23.	Downloading and uploading attachments etc.

SCHEME OF STUDIES
Functional English

S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Use of past indefinite tense	2	6	8
2.	Use of 'was' 'were' ' questions and negatives	3	6	8
3.	Explaining a situations/ analysis	2	6	8
4.	Communication in writing	2	6	8
5.	Comprehension	1	6	7
6.	Application/ C.V.	1	6	7
7.	Dialogues	1	9	10
8.	Understand vocabulary	1	3	4
9.	Writing complaints/ answers to complaints	1	9	10
10.	Interviews	2	7	10
Total		16	64	80

DETAIL OF COURSE CONTENTS

Functional English

S. No	Detail of Topics	Theory Hours	Practical Hours
1	Use of past indefinite tense 1.1 Describing past events	2	6
2	Use of 'was' 'were' ' questions and negatives	2	6
3	Explaining a situations/ analysis 3.1 Making a plan 3.2 Visiting factory area 3.3 Giving justifications	2	6
4	Communication in writing 4.1 Asking for list of stationery items 4.2 Submitting report of performance of team of technicians 4.3 Submitting joining report	2	6
5	Comprehension: practice sets	2	6
6	Job application/C.V.	1	6
7	Dialogues	1	9
8	Understand vocabulary	1	3
9	Writing complaints/ answers to complaints	1	9
10	Interviews	2	7
Total		16	64

LIST OF PRACTICALS
Functional English

S. No.	Practical
1.	Group discussion
2.	Interviews
3.	Role play

LIST OF LABS

Auto Electrician

- Auto Electrician Workshop

I.T Fundamentals

- Computer Lab

LIST OF TOOLS / EQUIPMENT ETC.

(For a Class of 25 Students)

Name of Trade	Auto Electrician
Duration	6-Months

S. No.	Name of Tools / Equipment	Quantity
1.	Combination open end ring spanner set (6-32mm)	05 Nos.
2.	First Aid Box	2 No.
3.	Fire buckets	5 No.
4.	Fire extinguisher DCP 6-8 Kg	2 No.
5.	Fire extinguisher Co2 8 Kg	2 No.
6.	Safety Helmets	25 No.
7.	Safety Goggles	15 No.
8.	Double end off set ring spanner (6-32mm)	05 Nos.
9.	Socket set (8-32 mm)	05 Nos.
10.	Allen Key set (1.5-10mm)	05 Nos.
11.	Adjustable wrench (1')	02 Nos.
12.	Combination plier (20cm)	05 Nos.
13.	Side cutter plier (16cm)	05 Nos.
14.	Lock Plier (15cm)	05 Nos.
15.	Long Nose Plier (16cm)	05 Nos.
16.	Grip Plier (10inch)	02 Nos.
17.	Crimping Plier	02 Nos.
18.	Ball Peen Hammer (250gm)	05 each.
19.	Flat Screw driver (4' 6' 8' 12')	02 each.
20.	Philip screwdriver (3' 4' 6' 8')	02 each.
21.	Hammer screw driver set	02 Nos.
22.	Hacksaw frame (300mm)	03 Nos.
23.	File (flat)with handle (150 to 300)	02 Nos.
24.	Hand drill Machine (Electric)	02 Nos.

25.	Twist drill set (1mm to 12mm)	02 Nos.
26.	Diode removing and fitting tools	01 Nos.
27.	Vernier Caliper (0-160mm)	05 Nos.
28.	Wire gauge (standard)	02 Nos.
29.	Feeler gauge (0.5 to 1 mm with 10 blade)	05 Nos.
30.	Volt Meter (0-20 V)	01 Nos.
31.	Ampere Meter (0-25 Amp)	01 Nos.
32.	Multi-meter	02 Nos
33.	Techno-meter & Dwell Meter (Standard 4 to 8 cylinders)	02 Nos.
34.	Hydrometer	10 Nos.
35.	Ignition timing light	02 Nos.
36.	Growler Tester	02 Nos.
37.	Soldering Iron (45 W & 75 W)	10 Each.
38.	Tool kit (empty)	05 Nos.
39.	Oil Can (0.25 litter)	01 Nos.
40.	Bench voices (05" size)	03 Nos.
41.	Work benches (6'x 2.5'x 2.75')	05 Nos.
42.	Writing board	01 Nos.
43.	Battery charger 12 V /24 V (32 Amp)	02 Nos.
44.	Battery terminal cleaner	02 Nos.
45.	Wiring Board	05 Nos.
46.	Star Allen key set	2 set.
47.	Socket screw driver (02 to 10 mm)	05 sets.
48.	Condenser tester (0.02 to 0.25 uf)	02 Nos.
49.	Tool Cabinet (18"x24"x36")	04 Nos.
50.	Gasoline Engine mounted on Frame with diagnosis socket	1 No.
51.	Self Starter	5 No
52.	Car Generator	05 No.
53.	Car Generator test bench	05 No.
54.	Spark plugs	10 No.
55.	Distributor	2 No.

56.	Spark plug cleaner	08 No.
57.	Throttle body along with sensor	02 No.
58.	Coolant temperature sensor	1 No.
59.	Electric steering motor	02 No.
60.	Contact spare wire	03 No.
61.	Air bag with grip	02 No.
62.	Bench grinder	1 no
63.	Car AC unit Complete	1 No.

COMPUTER LAB

S. No.	Tools / Equipment	Quantity
1.	Desktop computer (Specifications as per notification issued by MIS Section, TEVTA)	26 (1 for each student & 1 for the teacher)
2.	Printer (Laser)	01
3.	Scanner	01
4.	Internet Connection (At least 1 MB speed)	01
5.	UPS 10 KVA	01
6.	Air Conditioner 1 ½ Ton	02
7.	Multimedia Projector	01

LIST OF CONSUMABLE
(For a Class of 25 Students)

Auto Electrician

S. No.	Nomenclature of Equipment / Tools	Quantity
1.	Bio-Clean Ultrasonic Cleaning Fluid 5LT	1 (160 injector)
2.	Flowrite Cleaning and Flowing Fluid 5LT	1 (6 months)
3.	Auto wire 3mm and 5mm	2 Roll each
4.	Thimbles male & Female	1 Packet each
5.	Insulation tape	1 Dozen
6.	Auto bulb single point	1 Dozen
7.	Auto bulb double point	1 Dozen
8.	Head lamp blubs	10 No.
9.	Bulb holder single & double point	6 No. each
10.	Fuses Assorted Amps	1 Packets
11.	Solder wire 60/40	1 Roll
12.	Soldering paste	1 Tin
13.	Cotton waste	20 Kg
14.	Cotton gloves	3 Dozen
15.	Distilled water	20 litter
16.	Sulphuric acid	2 Kg
17.	Battery terminals	6 Pair
18.	Grease	1 KG
19.	Starter motor brush	5 Set
20.	Alternator carbon brush	5 Set
21.	Petrol / Kerosene oil	20 liter
22.	Distributor of assorted Vehicle	02 No.
23.	Combination switch	2 No.
24.	Flashers	5 no.
25.	Horn relay	5 No.
26.	Horn	5 No.
27.	Indicator switch	2 No.
28.	Wind shield wiper motor	2 No.
29.	CB point	1 No

30.	Condenser for relevant distributor	1 No.
31.	Different electric & electronic components for demonstration & practice	As per requirement
32.	Ordinary fasteners used in shop	As per requirement
33.	AC Compressor of different Vehicle	5 No.
34.	Ignition switch with key	2 No.

Functional English

S. No.	Item	Quantity
1.	Stationery	As per requirement
2.	Board Markers	As per requirement

I.T Fundamentals

S. No.	Item	Quantity
1.	Printing Paper	As per requirement
2.	Printer Toner	As per requirement

EMPLOYABILITY OF PASS-OUTS

The pass-outs of this course can find job / employment opportunities in the following areas.

1. Self employment (workshop)
2. Authorized sales / service dealers
3. Auto Parts manufacturing industries, vendors etc.
4. Private workshops.
5. Potential manufacturer's having large transport fleet.

REFERENCE BOOKS

Auto Electrician

1. Automotive mechanics by W.H Crouse
2. Auto Electricity & Electronics technology by James E Duffy
3. Advanced automotive fault diagnosis by Tom Denton
4. Engine management & fuel injection systems pin tables & wiring diagrams volume 1-2
5. Automotive technology system approach by Jashrouf

Functional English

1. High School English Grammar By Wren & Martin
2. Oxford English Grammar

I.T Fundamentals

1. Introduction to Computer by Peter Norton
2. 2007 Microsoft® Office System Step by Step by Joyce Cox, Steve Lambert and Curtis Frye
3. Internet and E-mail with Windows 7 by Studio Visual Steps

MINIMUM QUALIFICATION OF INSTRUCTOR

- D.A.E (Auto & Farm) / D.A.E (Auto & Diesel) with 1 year relevant experience

Functional English

- MA. (English)

I.T Fundamentals

- DAE CIT/ BCS from HEC recognized university

Curriculum Revision Committee

- | | | |
|-----------|--|-----------------|
| 1. | Engr. Atif Latif,
Assistant Manager (R&D),
TEVTA Secretariat,
Lahore | Convener |
| 2. | Mr. Rana Tahir,
Sr. Instructor,
GTTI Sheikhpura | Member |