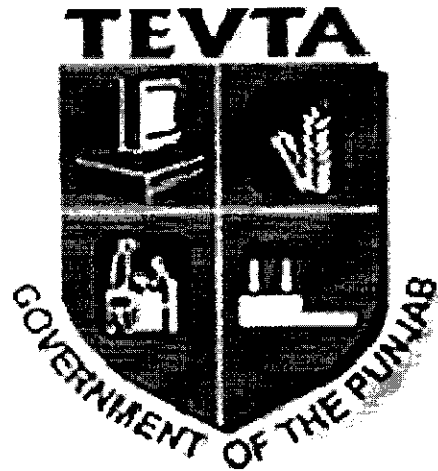


GOVERNMENT OF THE PUNJAB
TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY



CURRICULUM FOR

Electronically Controlled Engine Diagnostic & Tune-up

(3- Months Course)

Revised April 2016

APPROVED

Date: 7-4-16

Sign: 

CURRICULUM SECTION
ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE

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TRAINING OBJECTIVES

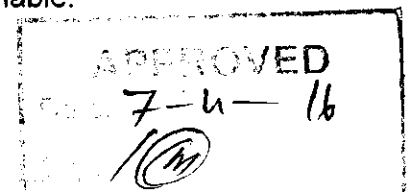
Today's Automotive technology is fast changing from mechanical to electronics, from analogue to digital and from carbureted to electronic fuel injectors due to the competition and pressures to produce more efficient and economical vehicle's which are not only efficient but also adhere to very stringent emission and safety regulation thus to Service, repair and Diagnose these vehicles specialized equipment are being used to do job to maintain it repair quality and car road worthy. Following three equipment are being used universally to diagnose repair and service the vehicle's.

1. Scanners
2. Oscilloscope
3. Injector testing and cleaning equipment

Any person with understanding of these three equipment can not only work with the diagnostic but also take supervisory responsibilities. Following is the brief on these machines.

1. Scanners is very vital instrument as every vehicle after year 96 has an on board diagnostic systems to access the systems one needs software of the vehicle and interface for your computer once accessed it reads and erases diagnostics. Gives live data reading for sensor, actuators and Injectors and where possible does relearning procedures.
2. Pico Scope checks on all electronic circuits and with simple knowledge of scopes waveform which is inbuilt in its software program authenticate fault.
3. Injector is one section of the vehicle which meters the fuel into the combustion chambers there is no certain method to ascertain the volume balance, spray pattern and leakage in on vehicle situation you need asnu to diagnose off vehicle as it simulate and gives visual of in chamber like situation.

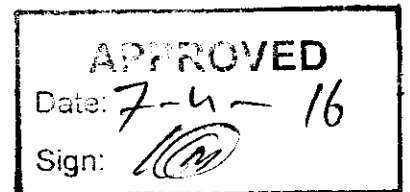
Therefore understanding these equipment Technician will not only be employable worldwide his knowledge will be upgradable as he will be working with software based technology easy to understand and easily enter management supervisory employment and also take on self-employment with anyone of the equipment to cater to lower end of the workshops thus making them market viable.



Electronically Controlled Engine Diagnostic & Tune-up Course (3- Months)

CURRICULUM SALIENTS:

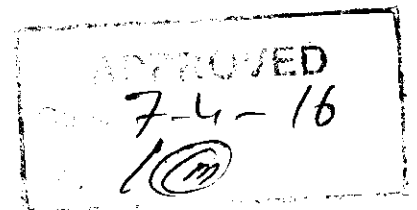
Entry level min	:	01-year "Auto Electrician/ Auto & farm/ Auto Mechanic Certificate " OR Middle with more than 2-years relevant field experience
Duration	:	3-Months
Total Training Hours	:	400 Contact Hours
Training Methodology	:	80% Practical 20% Theory
Medium of Instructions	:	Urdu/ English



SKILL COMPETENCY DETAILS

After successful completion of this course the student should be able to:-

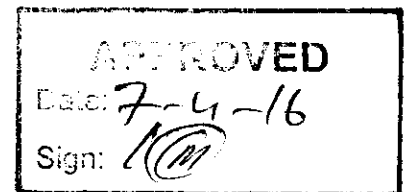
1. Implement the SOP for Auto diagnostic
2. Apply the diagnostic flowchart diagram properly
3. Implement of diagnostic and maintenances procedure correctly.
4. Properly use the equipment needed.
5. Manage the documentation of vehicles in the workshop
6. Use of diagnostic equipment at the right time.
7. Rectify general vehicle problems



KNOWLEDGE PROFICIENCY DETAILS

After successful completion of this course the student should be able to:


1. Explain types of workshop practices – SOP-Diagnostic flowchart.
2. Describe methods Diagnostic and Maintenances.
3. Explain types of Equipment needed in the course.
4. Explain Advantages of using the Equipment.
5. Describe methods preparation Vehicle and equipment for Diagnostic.
6. Describe and identify general Vehicle Problem.
7. Describe precautionary Maintenance of Vehicles.
8. Describe general Methods Workshop Equipment Management.



SCHEME OF STUDIES

Electronically Controlled Engine Diagnostic & Tune-up (3 Months Course)

S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Basic Electricity & Magnetism	7	35	42
2.	Auto Motive Electronics	14	28	42
3.	Fuel and Emission Control System Electronics	14	33	47
4.	Ignition System Diagnosis & Repair	9	33	42
5.	EFI System Diagnosis & Repair	9	50	59
6.	Sensors, Actuators & ECM	10	42	52
7.	Engine Tune up	7	49	56
8.	I.T Fundamentals	4	16	20
9.	Functional English	15	25	40
Total Hours		89	311	400

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DETAIL OF COURSE CONTENTS
Electronically Controlled Engine Diagnostic & Tune-up
 (3 Months Course)

Sr. No.	Subject main Topic	Theory Hours	Practical Hours
1.	Basic Electricity & Magnetism 1.1 Atomic Structure of matter and electricity 1.2 Symbols used in electrical wiring 1.3 Conductor, Insulator, Semiconductor 1.4 Current, Voltage, Resistance Relationship 1.5 Ohm's Law 1.6 Series and Parallel Circuit 1.7 Short Circuit 1.8 Open Circuit 1.9 Ground Circuit 1.10 Use of Multimeter 1.11 Magnet, Magnetism and its properties 1.12 Application of Magnetism in generator, motor, relays solenoid	7	35
2.	Auto motive Electronics 2.1 Resistances 2.2 Resistance color codes 2.3 Capacitor function & types 2.4 Diodes 2.5 Rectifier assembly 2.6 Relay 2.7 Buzer 2.8 Solenoid 2.9 Regulator Doping 2.10 PN & NP type semiconductor's 2.11 Transistor 2.12 Thermistor 2.13 Logic Gates	14	28
3.	Fuel and Emission Control System Electronics 3.1 Modern fuel systems 3.2 Sub systems of fuel system 3.3 Detecting system 3.4 Fuel System schematic 3.5 Diesel Injection system 3.6 Gasoline Injection system 3.7 Electronic controls & checks in fuel system	14	33
4	Ignition System Diagnosis & Repair 4.1 Electronic ignition system & types 4.2 Distributer & distributorless ignition 4.3 Servicing the ignition system 4.4 Troubleshooting its causes & remedies of electronic ignition system	9	33

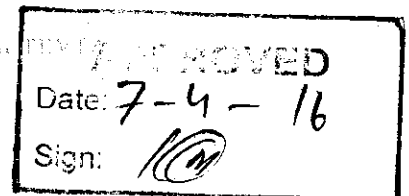
Electronically Controlled Engine Diagnostic & Tune-up Course (3- Months)

<p>5.</p>	<p>EFI System Diagnosis & Repair</p> <p>5.1 EFI system components 5.2 Compression of carbureted & EFI System 5.3 EFI Engine management 5.4 Sensors function & their servicing</p> <ul style="list-style-type: none"> • MAP sensor • MAF sensor • Throttle position sensor • Coolant temperature sensor • Intake air temperature sensor • RPM sensor • Camshaft position sensor • Knock sensor • Oxygen sensor <p>Actuators:</p> <ul style="list-style-type: none"> • Injectors • Idle speed control valve • Ignition <p>5.5 Self-diagnosis 5.6 Fail safe function 5.7 Processor ECU/ ECM/ PCM operating principle 5.8 Engine Diagnosing by Code detection</p>	<p align="center">7</p>	<p align="center">49</p>
<p>6</p>	<p>Servicing Sensors , Actuators & ECM</p> <p>6.1 Performance problems 6.2 Sensors troubleshooting 6.3 Sensors servicing 6.4 Actuator service 6.5 Ideal motor service 6.6 Fuel injectors service 6.7 Fuel pump service 6.8 Glow plug service 6.9 ECM Service , Memory saving & Adjustment</p>	<p align="center">10</p>	<p align="center">42</p>
<p>7</p>	<p>Engine tune up</p> <p>7.1 Tune up procedure 7.2 Typical steps 7.3 Safety measures in tuning engine</p>	<p align="center">7</p>	<p align="center">49</p>
<p align="center">Total</p>		<p align="center">70</p>	<p align="center">270</p>

7-6-16
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LIST OF PRACTICALS

1. Make series and parallel circuits
2. Measure Current, voltage and resistance of circuit using multi-meter
3. Verify Ohm's Law using multi-meter
4. Using capacitor in parallel and series
5. Check diode working using Ohmmeter
6. Check Transistor working using multi-meter
7. Checking PNP & NPN transistor
8. Checking SCR
9. Prepare full wave rectifier
10. Make Different Logic gate circuits
11. Checking different IC
12. Removing and refitting the fuel rail, injector and pressure regulator.
13. Understanding of vehicle electrical wiring diagram
14. Understanding general diagnostic flow chart of vehicle
15. Manual procedure of diagnostic coding and decoding of EFI system
16. Trace components of an electronically controlled ignition system
17. Perform a scan tester diagnosis of an idle speed control valve
18. Using scanner live data, adjust different actuators working
19. Perform a scan test procedure on various vehicles.
20. Perform diagnostic procedure with scanner on electronically controlled engine, and understanding of live data
21. Diagnosing EFI system
22. EFI System servicing
23. Using scanner, troubleshoot ignition system faults
24. Perform injector testing, leakage testing, atomization, Electronic conductance, spray pattern and volume, using electronic control injector, testing machine and also ultrasonic cleaning and rebuilding of injector
25. Perform to find emission levels on an EFI engine using 5-Gas digital exhaust gas analyzer and finding of problem cause.



SCHEME OF STUDIES
I.T Fundamentals


S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Introduction to Computers	1	4	5
2.	Typing - Microsoft Word	2	6	8
3.	Internet & Electronic Mail	1	6	7
Total		04	16	20

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DETAIL OF COURSE CONTENTS

I.T Fundamentals

S. No	Detail of Topics	Theory Hours	Practical Hours
1	Introduction to Computers 1.1 What is a computer- Definition, functions and general features? 1.2 What is Hardware – 1.2.1 Computer parts and units 1.2.1.1 Input Unit - Keyboard, Mouse etc. 1.2.1.2 Central Processing Unit 1.2.1.3 Output Unit 1.3 What is Software – 1.3.1 Electronic Parts of a Pc it is 1.3.1.1 Software and Its types 1.3.1.2 System Software, Application Software 1.4 Working with windows Operating System 1.4.1 How does windows desktops work? 1.5 What are the Icons, Shortcuts and other graphic, 1.5.1 How to see computer contents on different drives etc	1	4
2	Typing and Word processing (MS Word) 2.1 Proper way of typing correct and speedy - getting familiar with the keys 2.2 Where to type in computer? How to save a file? How to get it back? Where to find your saved work? 2.3 How to get it printed?	2	6
3	Emailing and Internet Surfing 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.?	1	6
Total		04	16

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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.	Copying, Deleting and Moving Files in a folder
7.	Working with different Applications
8.	Opening MS Word for typing
9.	First lesson of Typing A S D F
10.	Second Lesson of typing J K L ;
11.	Third Lesson U I O P
12.	Fourth Lesson R E W Q
13.	Fifth Lesson N M , .
14.	Sixth Lesson V C X Z
15.	Seventh Lesson All letter using R index Finger
16.	Eighth Lesson All letter using L index Finger
17.	Formatting in MS Word Bold, Italic etc.
18.	Using Internet
19.	Opening Email, making new account
20.	Sending Receiving Emails

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SCHEME OF STUDIES
Functional English

S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Introduction of English Sentence Structure	2	3	5
2.	Use of present indefinite tense	2	3	5
3.	Use of 'is' 'are' 'am' questions and negatives	2	3	5
4.	Ask questions	2	3	5
5.	Express daily routines	2	3	5
6.	Know how to address people	1	2	3
7.	Provide written feedback	1	2	3
8.	Dialogues	1	2	3
9.	Understand vocabulary	1	2	3
10.	Application/C.V.	1	2	3
Total		15	25	40

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DETAIL OF COURSE CONTENTS
Functional English

S. No	Detail of Topics	Theory Hours	Practical Hours
1	Introduction of English sentence structure	2	3
2	Use of present indefinite tense with exercises	2	3
3	Use of 'is' 'are' 'am' questions and negatives	2	3
4	4.1 Ask questions 4.1.1 At work place 4.1.2 In the market 4.1.3 In classroom	2	3
5	5.1 Express daily routines 5.1.1 Before going to college 5.1.2 Dealing with colleagues 5.1.3 Going to market	2	3
6	6.1 Know how to address people 6.1.1 In Meetings 6.1.2 In class	1	2
7	7.1 Provide written feedback 7.1.1 After visiting the market 7.1.2 On some official task	1	2
8	8.1 Dialogues 8.1.1 With colleague 8.1.2 Teacher/student 8.1.3 Employer/employee 8.1.4 Booking on railway station	1	2
9	Understand vocabulary	1	2
10	Application / C.V.	1	2
Total		15	25

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LIST OF PRACTICALS
Functional English

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

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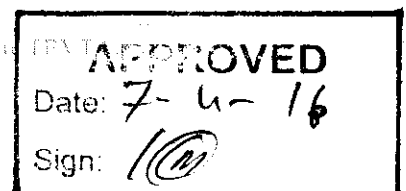
LIST OF LABS

Electronically Controlled Engine Diagnostic & Tune-up

- Auto Electronics lab

I.T Fundamentals

- Computer Lab



Electronically Controlled Engine Diagnostic & Tune-up Course (3- Months)


LIST OF MACHINERY / EQUIPMENT / TOOLS

(For a class of 25 students)

Name of Trade	Electronically Controlled Engine Diagnostic & Tune-Up
Duration of Course	03 – Months

Sr. No.	Nomenclature of Machines	Quantity Nos.
1.	OBD Scanner	1
2.	Laptop	1
3.	Automotive universal scanner	5
4.	Emission 5 Gas analyzer with Diagnostic Software	1
5.	EFI injector testing machine (upgradable)	2
6.	Advance Digital Multi-meter	5
7.	Multimedia	1
8.	Late model of electronically controlled engine simulator	5
9.	Complete basic hand tools kit	1
10.	Electromagnetism master board (for performing Basic Practicals of Magnetism)	5
11.	Electricity master boar (For developing circuits, i.e. Series & Parallel Circuits)	5
12.	Electronic master kit (for Electronic Components, i.e. diode, Transistor & thyristor)	1

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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

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LIST OF CONSUMABLE MATERIALS
FOR CLASS OF 25 TRAINERS

Electronically Controlled Engine Diagnostic & Tune-Up


S. No.	List of Items	Quantity
1	Bio-Clean Ultrasonic Cleaning Fluid 5LT	1 (160 injector)
2	Flowrite Cleaning and Flowing Fluid 5LT	1
3	Bucket Filters	10
4	O-Rings	24
5	Gloves	60
6	Wires roll	5
7	Cotton waste	20 Kg
8	Gas Analyzer Filters	10
9	Scanner Software	Per Year
10	Grease	2 Kg
11	Electrolyte	5 Ltr
12	Fuses different Amps	24

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

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REFERENCE BOOKS


1. Advanced Automotive Fault Diagnosis By Tom Denton
2. Engine Management & Fuel Injection Systems Pin Tables & Wiring Diagrams Volume 1-2
3. 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

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MINIMUM QUALIFICATION OF INSTRUCTOR

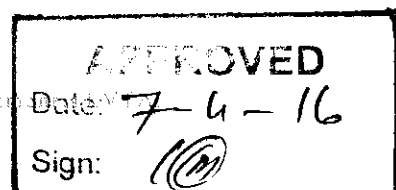
- D.A.E (Auto & Form) / D.A.E (Auto & Diesel) essentially having knowledge / experience of computer controlled automotive vehicles

Functional English

- M.A. (English)


I.T Fundamentals

- DAE CIT/ BCS from HEC recognized university



EMPLOYABILITY OF PASS-OUTS

1. Job as Equipment technician of the tune-up center.
2. Job as supervisor of the tune-up center.
3. Job as staff Trainer on engine diagnostic and troubleshooting procedures.
4. Self-Employment.

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List of Trade Related Jargon
GENERAL VOCABULARY WORDS

1. Safety precautions	حفاظتی تدابیر	1. Cooling system	نظام ٹھنڈک
2. Tools	اوزار	2. Viscosity	گاڑھا پن
3. Equipment	آلات	3. Rusting	زنگ آلودگی
4. First Aid	ابتدائی طبی امداد	4. Ignition switch	جابی سوئچ
5. Bleeding	خون بہنا	5. Muffler	سلنسر
6. Fracture	بڈی ٹوٹنا	6. Heat	حرارت
7. Measurement	پیمائش	7. Technical	تکنیکی
8. Tri Square	گنیا	8. Check up	معائنہ
9. Plier	پلاس	9. Conductor	موصل
10. Screw Driver	بیچ کس	10. Non conductor	غیر موصل
11. Divider	پرکار	11. Resistance	رکاوٹ
12. Files	ریتی	12. Parallel	متوازی
13. Hack saw	آری	13. Series	سلسلہ وار
14. Scissor	قینچی	14. Magnet	مقناطیس
15. Spanner	پانا	15. Tread	گڈی
16. Socket	گوٹی	16. Parking brake	بینڈ بریک
17. Bench vice	بانک	17. Hood	بونٹ
18. Chain Hoist	چین کپی	18. Trunk	ٹگی
19. Length	لمبائی	19. Automobile	گاڑی
20. Volume	حجم	20. Fuel feed pump	لفٹی پمپ
21. Mass	کیمیت	21. Glow plug	بیٹر
22. Work	کام	22. Lubrication system	نظام چکنائی
23. Power	طاقت	23. Elctricial System	برقی نظام
24. Energy	توانائی		
25. Kinetic energy	حرکی توانائی		
26. Friction	رگڑ		
27. Fuel	ایندھن		
28. Combustion	اختراک		
29. Reciprocating	متقافی		

Curriculum Revision Committee

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