



Co-funded by the European Union



german  
cooperation  
DEUTSCHE ZUSAMMENARBEIT



Norwegian Embassy  
Islamabad



© TVET SSP

# AUTO MECHANIC

## CBT Curriculum

### National Vocational Certificate Level 2-4

Version 1 - August 2019



Implemented by

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

**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

**Responsible**

Director General Skills Standard and Curricula, National Vocational and Technical Training Commission  
National Deputy Head, TVET Sector Support Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

**Layout & design**

SAP Communications

**Photo Credits**

TVET Sector Support Programme

**URL links**

Responsibility for the content of external websites linked in this publication always lies with their respective publishers. TVET Sector Support Programme expressly dissociates itself from such content.

This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, 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 (NAVTTTC) 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**

August, 2019

**Islamabad, Pakistan**

© TVET SSP

# AUTO MECHANIC

**CBT Curriculum**

National Vocational  
Certificate Level 2-4

Version 1 - August 2019

Introduction	3
Purpose of the training programme	3
Overall objectives of training programme	4
Competencies to be gained after completion of course	4
Possible available job opportunities available immediately and later in the future	4
Trainee entry level	5
Minimum qualification of trainer	5
Recommended trainer: trainee ratio	5
Teaching strategies in a competency-based environment	5
Medium of instruction i.e. language of instruction	6
Duration of the course (Total time, Theory & Practical time)	6
Sequence of the modules	6
Summary – overview of the curriculum	8
Modules	13
Module 1: Demonstrate Communication Skill	13
Module 2: Maintain Safe Work Environment	16
Module 3: Repair Ignition System	18
Module 4: Repair Fuel System (Carburetor)	21
Module 5: Perform Service of Electronic Fuel Injection Systems	24
Module 6: Repair Engine Cooling System	27
Module 7: Repair Engine Lubrication System	30
Module 8: Perform Overhauling of Engine	32
Module 9: Repair Manual Transmission System	38
Module 10: Repair Automatic Transmission System	42
Module 11: Repair Braking Systems	45
Module 12: Repair Suspension / Steering System	49
Module 13: Carry out Wheel Balancing and Alignment	54
Assessment Guidance for Auto Mechanic	57
Types of assessment	57
Principles of assessment	57
Assessment strategy for Auto Mechanic	59
Assessment template – Sessional and Summative assessment	59
Complete list of tools and equipment	61
List of consumable supplies	65
Credit values	68

## Introduction

Today's 'World of Work' has undergone radical changes. The emergence of new technologies, global markets for products and services, and international competition require economies to upgrade and enhance the skill level of their human resources. Technical and Vocational Education and Training (TVET) systems all over the world are constantly challenged by this question that how to respond to the demand of a knowledge-based economy. As TVET systems and their training programmes directly relate to the world of work in terms of quantity and quality output, the approach of TVET programmes need to focus on the acquisition of technical and non-technical skills, also referred to as employability skills.

With the release of the National Skills Strategy 2009-2013 the Pakistan government has made skills development a political priority. The framework for skills development aims to:

- Change TVET education from time-bound, curriculum-based training to flexible, competency-based training;
- Bring about a shift from supply-led training to demand-driven (outcome-based) skills development by promoting the role of industry in designing and delivering TVET.

The curriculum for **Auto Mechanic Level 2-4** aims to respond to this demand. It has been developed as an outcome-based course designed to teach the employability skills needed to succeed in a high-performance work environment, as defined by labour market requirements.

An Auto-Mechanic is a tradesman who specializes in the mechanical systems contained within automotive vehicles. This person is an expert on overhauling the entire vehicle systems i.e. diagnose and repair of Ignition System, Fuel System (Carburetor & EFI system), Engine Cooling, Lubrication Systems, manual & automatic transmissions, vehicle braking, suspension, steering, wheel balancing and alignment. All competencies fall under the Auto Mechanic's domain of expertise. The job of an Automobile Mechanic is perfect for those who love to work with their hands.

This is a job that involves constant activity, so it is perfect for someone who dreads the idea of sitting at a desk all day. Auto Mechanic is hired by car manufacturers, car dealers and auto repair shops.

### Purpose of the training programme

Automobile industry is dynamic and ever changing as complex technological advancements are taking place in this sector. Therefore, industry expectations for skilled workforce are also dynamic which can only be managed through setting relevant competency standards in collaboration with the leading industries.

The purpose of the training program is to inline the industry (dealerships / local workshops) with the training institutes to fill the gap of learning and performing the actual job, building the strong relationship with the employer for exchanging technology between institutes and organization.

- The learner will achieve hands on learning experience prior to the industry.

- The learner can enhance the skills, knowledge, and attitude after attainment of institute based training while doing the actual job.
- The learner can achieve his desire goals to get employed or earning from the industry.

### **Overall objectives of training programme**

The objective of this course is to produce skilled Automobile Mechanic for the market. The course has been developed keeping in view the market needs as it has been developed after making a competency profile for an Auto Mechanic. Major focus of this course is on equipping the trainees with core as well as technical competencies required to perform the job of an Auto Mechanic efficiently and effectively.

The course is hence; designed in such a way that it has a major portion which is devoted to practical skills is aided by theory to gain maximum benefit. After completing the course, trainee will be able to work as a skilled worker in auto industry, or can start his own business.

This course can also be helpful for existing workers who want to improve their technical skills in this field.

### **Competencies to be gained after completion of course**

Curriculum modules (training input) are clusters of competencies expressed in learning units, learning outcomes, and learning elements. After successful completion of curriculum modules of this course, the trainee will gain a range of competencies required to proceed in the world of work. The competencies stated below reflects industry requirements expressed in competency standards (training output).

- Demonstrate Communication Skill
- Maintain Safe Work Environment
- Repair Ignition System
- Repair Fuel System (Carburetor)
- Perform Service of Electronic Fuel Injection Systems
- Repair Engine Cooling System
- Repair Engine Lubrication System
- Perform Overhauling of Engine
- Repair Manual Transmission System
- Repair Automatic Transmission System
- Repair Braking Systems
- Repair Suspension / Steering System
- Carry out Wheel Balancing and Alignment

### **Possible available job opportunities available immediately and later in the future**

The level 2 training course related to Auto Mechanic transfers work-readiness skills (employability skills) and articulates with a number of level 3 training programmes. Based on the design and flexible approach, qualified trainees will find opportunities in a number of specialised areas to work in Automobile Service Workshop, Assembly Plants, Multinational Companies (MNCs) or Self Employed Business.

After completion of level 2 training programme qualified trainees can further progress and embark on a career till supervisory level, with job opportunities as Technician, & then to Floor/ Shop Supervisor, in government, semi-government organizations or owner of a private enterprise.

Experienced Auto Mechanic may advance through promotions with the same employer or by moving to more advanced positions with other employers.

The candidate will be opportunist of the following industrial sectors.

1. Automobile repair workshops and dealerships.
2. Automobile assembly plant and automobile vender industry.
3. Power generation sector.
4. Ships and marines engines.

### **Trainee entry level**

Individuals who wish to enter this course of study have to comply against the following criteria:

- Grade 8 (Middle) or equivalent;
- Comfort level of English language and mathematics;
- Satisfactory completion of appropriate admission assessment test.

### **Minimum qualification of trainer**

Trainers who wish to offer this programme should meet one of the following requirements:

- B-Tech (Hons)/ BS Tech. in relevant Technology ; or
- Diploma Associate Engineer (DAE) and 3 years relevant work experience; or
- 2 Year Certificate as Auto Mobile Mechanic with 5 years relevant work experience

Trainers offering this programme must be computer literate and be conversant with the delivery of competency-based education and training (CBT). All legislative requirements applicable to carry out training and assessment, if any, must be complied with.

### **Recommended trainer: trainee ratio**

The workshop facility is dependent upon the trainee and trainer ratio that might be changed as per actual context, recommended trainees trainer ratio is 20:1.

### **Teaching strategies in a competency-based environment**

Training in a competency-based environment differs from the traditional method of training delivery. It is based on defined competency standards, which are industry oriented.

The traditional role of a trainer changes, & shifts towards facilitation of training. A facilitator in Competency Based Training (CBT) encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and are engaged in different activities. Few are conducting practical tasks in the workshop, while others are writing, & some are not even in the classroom or workshop but in another part of the building using specialized equipment, working on computers doing research on the Internet or in the library. As trainees learn at different pace, they might well be at different stages in their learning, thus learning must be tailored to suit individual needs.

The following facilitation methods (teaching strategies) are generally employed in CBT programs:

- **Direct Instruction Method:** This might be effective when introducing a new topic to a larger group of trainees in a relative short amount of time. In most cases this method relies on one-way communication, hence there are limited opportunities to get feedback on the trainee's understanding.
- **Discussion Method:** This allows trainees to actively participate in sharing knowledge and ideas. It will help the trainer to determine whether trainees understand the content of the topic. On the other hand, there is a possibility of straying off topic under discussion and some trainees dominating others on their views.
- **Small Group Method:** Pairing trainees to help and learn from each other often results in quick knowledge/ skill transfer, than with the whole class. The physical arrangement of the classroom/ workshop and individual assessment may be challenging also, hence using analogy method is recommended.
- **Problem Solving Method:** This is a very popular teaching strategy for Competency Based Training (CBT). Trainees are challenged and are usually highly motivated when they gain new knowledge and skills by solving problems (Contingency skills). Trainees develop critical thinking skills and the ability to adapt to new learning situations (Transfer skills). It might be time consuming and because trainees sometimes work individually, they may not learn all the things that they are expected to learn.
- **Research Method:** This is used for workshops and laboratory tasks, field experiments, and case studies. It encourages trainees to investigate and find answers for themselves and to critically evaluate information. It however requires a lot of time and careful planning of research projects for the trainee.

### **Medium of instruction i.e. language of instruction**

The medium of the instruction is Urdu or local language, the contents for the training is available in English/ Urdu.

### **Duration of the course (Total time, Theory & Practical time)**

The course duration for the level-2 is 700 learning hours including training and assessment.

The course duration for the level-3 is 420 learning hours including training and assessment.

The course duration for the level-4 is 660 learning hours including training and assessment.

### **Sequence of the modules**

The curriculum for Auto Mechanic consists of thirteen (13) modules and should be delivered in the following sequence, (Learning units within the modules can be delivered interchangeably as stand-alone modules or in a holistic approach):

For the level-2 qualification, the learning hours are 700 or 70 credits. The qualification has the following competency standards:

- Demonstrate Communication Skills



- Maintain Safe Work Environment
- Repair Ignition System
- Repair Fuel System (Carburetor)
- Repair Engine Cooling System
- Repair Engine Lubrication System
- Repair Braking Systems
- Carry out Wheel Balancing and Alignment

For the Level-3 qualification, the learning hours are 420 or 42 credits. The qualification has the following competency standards:

- Perform Service of Electronic Fuel Injection Systems
- Repair Suspension / Steering System

For the Level-4 qualification, the learning hours are 660 or 66 credits. The qualification has the following competency standards:

- Perform Overhauling of Engine
- Repair Manual Transmission System
- Repair Automatic Transmission System

All theoretical content related to the modules should be delivered, where possible, in an applied setting related to the Auto Mechanic work environment.

## Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 1:</b> Demonstrate Communication Skill</p> <p><b>Aim:</b> After completing this module student will be able to use appropriate communication skills at workplace.</p>	<p><b>LU1:</b> Working in Team <b>LU2:</b> Dealing with Clients <b>LU3:</b> Demonstrating Basic IT Skills</p>	<p>02 Hours 02 Hours 04 Hours</p>	<p>04 Hours 08 Hours 10 Hours</p>	<p>06 Hours 10 Hours 14 Hours</p>
<p><b>Module 2:</b> Maintain Safe Work Environment</p> <p><b>Aim:</b> After completing this module student will be able to diagnose hazards in Automobile repair works &amp; apply occupational health &amp; safety procedure according to their work plan.</p>	<p><b>LU1:</b> Identifying Hazards at Workplace <b>LU2:</b> Observing Occupational Safety and Health (OSH)</p>	<p>05 Hours 05 Hours</p>	<p>10 Hours 10 Hours</p>	<p>15 Hours 15 Hours</p>
<p><b>Module 3:</b> Repair Ignition System.</p> <p><b>Aim:</b> This module is designed to provide skills and knowledge to Repair ignition system of vehicle and diagnose faults related to ignition system.</p>	<p><b>LU1:</b> Diagnose Faults of Ignition System. <b>LU2:</b> Remove Faults of Ignition System.</p>	<p>10 Hours 10 Hours</p>	<p>40 Hours 40 Hours</p>	<p>50 Hours 50 Hours</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 4:</b> Repair Fuel System (Carburetor)</p> <p><b>Aim:</b> This Module is designed to provide skills and knowledge to repair fuel system (Carburetor) and diagnose faults of fuel system and repair the fuel system.</p>	<p><b>LU1:</b> Diagnose Faults in Fuel System (Carburetor) <b>LU2:</b> Remove Faults in Fuel System (Carburetor)</p>	<p>06 Hours 14 Hours</p>	<p>20 Hours 60 Hours</p>	<p>26 Hours 74 Hours</p>
<p><b>Module 5:</b> Perform Service of Electronic Fuel Injection Systems</p> <p><b>Aim:</b> This Module is developed to provide skills and knowledge to service the Electronic Fuel Injection (EFI) System and diagnose fuel system problems of vehicle.</p>	<p><b>LU1:</b> Diagnose Faults in EFI System <b>LU2:</b> Perform Service of the EFI System <b>LU3:</b> Perform Service of the Common Rail Diesel Fuel Injection System</p>	<p>10 Hours 10 Hours 10 Hours</p>	<p>50 Hours 50 Hours 50 Hours</p>	<p>60 Hours 60 Hours 60 Hours</p>
<p><b>Module 6:</b> Repair Engine Cooling System</p> <p><b>Aim:</b> This module is developed to provide skills and knowledge to service and repair air and water cooled engine cooling systems</p>	<p><b>LU1:</b> Diagnose Fault in Engine Cooling System <b>LU2:</b> Repair or Replace radiator and Auxiliary Components</p>	<p>10 Hours 10 Hours</p>	<p>40 Hours 40 Hours</p>	<p>50 Hours 50 Hours</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 7:</b> Repair Engine Lubrication System.</p> <p><b>Aim:</b> This module is developed to provide skills and knowledge to service and repair different types of engine lubricating systems and other maintenance issues of automobile engines while ensuring safe use of tools, equipment and materials.</p>	<p><b>LU1:</b> Diagnose Faults in Lubrication System. <b>LU2:</b> Repair or Service Engine Lubrication System.</p>	<p>12 Hours 12 Hours</p>	<p>48 Hours 48 Hours</p>	<p>60 Hours 60 Hours</p>
<p><b>Module 8:</b> Perform overhauling of Engine</p> <p><b>Aim:</b> You will be able to diagnose fault/s and other maintenance issues of automobile engines while ensuring safe use of tools equipment and materials</p>	<p><b>LU1:</b> Inspect Engine of the Vehicle. <b>LU2:</b> Remove Engine from the Vehicle. <b>LU3:</b> Dismantle the Components of the Engine. <b>LU4:</b> Repair the Engine. <b>LU5:</b> Re-fit Engine in the Vehicle.</p>	<p>10 Hours 08 Hours 10 Hours 10 Hours 10 Hours</p>	<p>40 Hours 40 Hours 44 Hours 38 Hours 30 Hours</p>	<p>50 Hours 48 Hours 54 Hours 48 Hours 40 Hours</p>
<p><b>Module 9:</b> Repair Manual Transmission System</p> <p><b>Aim:</b> This module is designed to provide skills and knowledge to repair manual transmission of vehicle and diagnose faults related to transmission system of vehicle and repair.</p>	<p><b>LU1:</b> Diagnose Faults in Manual Transmission System <b>LU2:</b> Repair Manual Transmission System <b>LU3:</b> Repair auxiliary transmission components</p>	<p>10 Hours 10 Hours 10 Hours</p>	<p>50 Hours 50 Hours 50 Hours</p>	<p>60 Hours 60 Hours 60 Hours</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p><b>Module 10:</b> Repair Automatic Transmission System</p> <p><b>Aim:</b> This module is developed to provide skills and knowledge to repair Automatic Transmission System and ancillary components and diagnose faults in Automatic Transmission System of the vehicle and repair the same.</p>	<p><b>LU1:</b> Diagnose Faults in Automatic Transmission System <b>LU2:</b> Disassemble Automatic Transmission System and Ancillary Components</p>	<p>30 Hours 30 Hours</p>	<p>80 Hours 100 Hours</p>	<p>110 Hours 130 Hours</p>
<p><b>Module 11:</b> Repair Braking Systems.</p> <p><b>Aim:</b> This module is designed to provide skills and knowledge to repair brake system of vehicle and perform inspection and diagnosis of faults of the brake system of vehicle, and perform road test to verify the performance of the vehicle.</p>	<p><b>LU1:</b> Diagnose Faults of Braking System. <b>LU2:</b> Perform Repair of the Braking System. <b>LU3:</b> Diagnose faults of Anti-Lock Braking System (ABS). <b>LU4:</b> Perform Repair of Anti-Lock Braking System (ABS).</p>	<p>5 Hours 5 Hours 5 Hours 5 Hours</p>	<p>20 Hours 20 Hours 20 Hours 20 Hours</p>	<p>25 Hours 25 Hours 25 Hours 25 Hours</p>
<p><b>Module 12:</b> Repair Suspension / Steering System</p> <p><b>Aim:</b> This Module is developed to provide skills and knowledge to repair suspension system and vehicle steering system. The learner will be able to diagnosis the faults as well as repair</p>	<p><b>LU1:</b> Diagnose Faults in Suspension System <b>LU2:</b> Repair or Service Suspension System <b>LU3:</b> Diagnose Steering System <b>LU4:</b> Repair of Steering System</p>	<p>10 Hours 10 Hours 10 Hours 10 Hours</p>	<p>50 Hours 50 Hours 50 Hours 50 Hours</p>	<p>60 Hours 60 Hours 60 Hours 60 Hours</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
accordingly.				
<p><b>Module 13:</b> Carry out Wheel Balancing and Alignment</p> <p><b>Aim:</b> This Module is designed to provide skills and knowledge related to wheel balancing and wheel alignment of vehicle. The learner will be able to diagnose the faults and repair it by using the wheel alignment machine and wheel balancing machines.</p>	<p><b>LU1:</b> Perform Wheel Balancing</p> <p><b>LU2:</b> Perform Wheel Alignment</p>	<p>10 Hours</p> <p>10 Hours</p>	<p>50 Hours</p> <p>50 Hours</p>	<p>60 Hours</p> <p>60 Hours</p>

# Modules

## Module 1: Demonstrate Communication Skill

**Objective of the module:** After completing this module student will be able to use appropriate communication skills at workplace.

**Duration:** 30 Hours      **Theory:** 08 Hours      **Practical:** 22 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Working in Team	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Treat team members with respect and maintain positive relationships to achieve common organizational goals</li> <li>Listen to instructions carefully &amp; comply with those instructions</li> <li>Provide work related information to team members and identify interrelated work activities to avoid confusion</li> <li>Adopt communication skills appropriate to work activities and company procedures</li> <li>Identify problems and resolve them through discussion and mutual agreement</li> </ul>	<ul style="list-style-type: none"> <li>Definition of Team</li> <li>Importance and Benefits of working in Team</li> <li>Role of team members and functionality of the teams</li> <li>Team dynamics and stages of team development</li> <li>Negotiation techniques</li> <li>Conflict resolution strategies</li> </ul> <p><b>Practical Activity:</b></p> <ol style="list-style-type: none"> <li>Make a team of 5 students; check the wiring of class room and lab. Discuss the problems in team. Make a report for the in-charge Maintenance.</li> </ol>	<p><b>Total</b> 06 Hours</p> <p><b>Theory:</b> 02 Hours</p> <p><b>Practical:</b> 04 Hours</p>	<ul style="list-style-type: none"> <li>Labs , Job Task (Theoretical or Practical Activity), Work Instructions, Equipment</li> <li>Smart LED TV for Classroom</li> </ul>	Workshop / Auto Lab

<p><b>LU2: Dealing with Clients</b></p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Collect and confirm work requirements from clients using appropriate communication procedures</li> <li>• Provide clear information to clients about work requirements including costs and time needed to accomplish the task</li> <li>• Negotiate with clients regarding wages, time, labour requirements etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Client, Value of Client.</li> <li>• Principles of effective and interactive communication</li> <li>• 7 C's of communication and their importance</li> <li>• Cultural and organizational practices for effective communication</li> <li>• Effective negotiation skills</li> <li>• Conflict resolution strategies</li> <li>• Negotiation techniques</li> <li>• Preparing relevant documents and reports</li> </ul> <p><b>Practical Activity</b></p> <ol style="list-style-type: none"> <li>1. Make a team of five members, two of them are service provider and rests three are client. Client requires some wiring in his office. Service provider should discuss about the types of cable, cost and quality. Service provider and client should negotiate on the cost.</li> </ol>	<p><b>Total</b> 10 Hours</p> <p><b>Theory:</b> 02 Hours</p> <p><b>Practical:</b> 08 Hours</p>	<ul style="list-style-type: none"> <li>• Labs , (Group Discussion / Practical Activity by making some students client and others service provider / Auto Mechanic), Work Instructions, Equipment if required</li> <li>• Multimedia for display of relevant videos</li> </ul>	<p>Class room/ workshop/ Auto Lab</p>
<p><b>LU3: Demonstrating Basic IT Skills</b></p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Create folders and files and learn major commands of operating system/windows</li> <li>• Type text and use major commands such as printing, editing, creating tables, header footer, footnotes, table of contents and page number etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Basic architecture of computer system</li> <li>• Input / output devices of computer and their functions</li> <li>• Basic computer skills using MS Word, MS Excel, use of internet, sending and receiving emails etc.</li> <li>• Preparing relevant documents and reports</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Client has demanded some electrical work through email from you. Make a Detail invoice for client and send it to him along with your company profile made in Power point, by email as per given instructions.</li> <li>2. Invoice should be saved in separate</li> </ol>	<p><b>Total</b> 14 Hours</p> <p><b>Theory:</b> 04 Hours</p> <p><b>Practical:</b> 10 Hours</p>	<ul style="list-style-type: none"> <li>• Computers</li> <li>• Multimedia</li> <li>• Internet Connection</li> </ul>	<p>Computer Lab</p>



	<ul style="list-style-type: none"> <li>• Make the document as per work specifications and client's requirement</li> <li>• Generate reports for clients using appropriate computer applications</li> <li>• Use internet for sending/receiving emails and connecting through social or other media</li> </ul>	<p>folder in your PC for further work.</p> <ol style="list-style-type: none"> <li>3. Prepare invoice in excel and word both formats.</li> <li>4. Send a small presentation (Power Point) of your company along with this invoice.</li> </ol>			
--	---	--	--	--	--

## Module 2: Maintain Safe Work Environment

**Objective of the module:** After completing this module student will be able to diagnose hazards in auto workshop & apply occupational health & safety procedure according to their work plan.

**Duration:** 30 Hours      **Theory:** 10 Hours      **Practical:** 20 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Identifying Hazards at Workplace	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Read and interpret work processes and procedures correctly to identify risk of hazards at workplace</li> <li>Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm</li> <li>Identify any potential hazards and take appropriate action to minimize the risk</li> </ul>	<ul style="list-style-type: none"> <li>Types of hazards that are most likely to cause harm to health and safety</li> <li>Health and safety precautions</li> <li>Health and safety signs and symbols</li> <li>Techniques and methods to identify the risks of hazards at workplace</li> </ul> <p><b>Practical Activity</b></p> <ol style="list-style-type: none"> <li>Visit Power lab of your institute, identify potential hazards. List PPE available and required to work there.</li> </ol>	<p><b>Total</b> 15 Hours</p> <p><b>Theory:</b> 05 Hours</p> <p><b>Practical:</b> 10 Hours</p>	<ul style="list-style-type: none"> <li>PPE</li> <li>Other Safety Equipment</li> <li>Firefighting Equipment</li> <li>Safety Charts</li> </ul>	Class room, Labs / Workshop
<b>LU2:</b> Observing Occupational Safety and Health (OSH)	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Work safely at all times, complying with health and safety precautions, regulations and other</li> </ul>	<ul style="list-style-type: none"> <li>Dealing with hazards to avoid any accident or injury</li> <li>Safety reporting procedures and documentation</li> <li>Use of Personal Protective Equipment</li> <li>First aid treatment methods including methods of resuscitation</li> </ul>	<p><b>Total</b> 15 Hours</p> <p><b>Theory:</b> 05 Hours</p> <p><b>Practical:</b></p>	<ul style="list-style-type: none"> <li>PPE</li> <li>Other Safety Equipment</li> <li>Firefighting Equipment</li> <li>Safety Charts</li> </ul>	Class room, Labs / Workshop

	<p>relevant guidelines</p> <ul style="list-style-type: none"> <li>• Identify health and safety hazards in the workplace, so that the potential for personal injury, damage to equipment or the workplace is prevented, and corrective action is taken</li> <li>• Deal with problems which are within your control, and report to the safety officer those problems that cannot be resolved</li> <li>• Wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures</li> <li>• Keep work area clean and clear of obstructions, and storing tools or equipment, so that the risk for accident or injury is prevented</li> </ul>	<ul style="list-style-type: none"> <li>• Fire-fighting methods</li> <li>• Safe methods of handling heavy loads</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate Fire fighting</li> <li>2. Demonstrate working on 440V (Panel) live circuit using appropriate PPE.</li> <li>3. Demonstrate first aid procedure for any victim of electric current</li> </ol>	10 Hours		
--	--	--	----------	--	--

## Module 3: Repair Ignition System

**Objective of the module:** This module is designed to provide skills and knowledge to Repair ignition system of vehicle by Auto Mechanic, in the light of manufacturer manual. You will be able to diagnose faults related to ignition system of vehicle and repair/ replace faulty part/s according to set standards.

**Duration:** 100 hours    **Theory:** 20 hours    **Practical:** 80 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults of Ignition System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Check electric power source and charging system of the vehicle for specified functionality and diagnose faults, if any.</li> <li>• Check ignition switch and ensure specified function and diagnose faults, if any.</li> <li>• Check ignition circuit continuity, connectivity &amp; installation, and ensure specified functioning and diagnose faults, if any.</li> <li>• Check Ignition coil and resistor to ensure specified function and diagnose faults, if any.</li> <li>• Check C.B. point and condenser to diagnose faults.</li> <li>• Check distributor unit and diagnose faults</li> </ul>	<ul style="list-style-type: none"> <li>• Define ignition system.</li> <li>• Enlist types of ignition system.</li> <li>• Describe the function of following parts of ignition system               <ol style="list-style-type: none"> <li>i. Battery.</li> <li>ii. Ignition coil.</li> <li>iii. Ignition switch.</li> <li>iv. Ignition distributor.</li> <li>v. CB point.</li> <li>vi. Ignitor</li> <li>vii. signal generator (pick up coil type, optical type, hall effect)</li> <li>viii. Capacitor.</li> <li>ix. Distributer cap.</li> <li>x. Rotor.</li> <li>xi. Ballast resistance.</li> <li>xii. High tension leads.</li> <li>xiii. Spark plug.</li> </ol> </li> <li>• Describe spark plug heat range.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Check electric source battery and check function of ignition system of vehicle and diagnose faults.</li> <li>2. Inspect ignition switch points.</li> <li>3. Check ignition system circuit and wires continuity and diagnose faults.</li> <li>4. Inspect ignition coil and resistor.</li> </ol>	<p><b>Total</b> 50 hours</p> <p><b>Theory:</b> 10 hours</p> <p><b>Practical:</b> 40 hours</p>	<ul style="list-style-type: none"> <li>• Battery charger</li> <li>• Combination spanner set.</li> <li>• Multimeter.</li> <li>• Screw driver set.</li> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Feeler gauge.</li> <li>• Spark plug cleaner and tester.</li> <li>• Timing light gun</li> <li>• Hydrometer</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Cotton waste</li> <li>• PPEs</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom</li> <li>• Engine lab</li> </ul>

	<ul style="list-style-type: none"> <li>• Check High tension cables for insulation breakdown, continuity, resistance and diagnose faults, if any.</li> <li>• Check cables for insulation breakdown, continuity &amp; resistance and diagnose faults, if any.</li> <li>• Check spark plugs for insulation, leakage, plug gap and type and diagnose faults, if any.</li> </ul>	<ol style="list-style-type: none"> <li>5. Inspect CB point, condenser.</li> <li>6. Check distributor unit and diagnose faults.</li> <li>7. Inspect high tension leads.</li> <li>8. Inspect spark plug gap.</li> <li>9. Adjust ignition timing</li> </ol>			
<b>LU2:</b> Remove Faults of Ignition System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace battery and related auxiliary components, clean and adjust terminals and wire clamps to ensure proper connectivity, if needed.</li> <li>• Replace/adjust alternator belt or replace alternator.</li> <li>• Check faulty fuse and replace with new fuse while ensuring correct rating.</li> <li>• Insulate wires or cables to provide specified current flow.</li> <li>• Replace ignition coil or resistor to ensure</li> </ul>	<ul style="list-style-type: none"> <li>• Define different terminology used in ignition system <ol style="list-style-type: none"> <li>i. Dwell angle.</li> <li>ii. Cam angle.</li> <li>iii. Firing order.</li> <li>iv. Ignition timing.</li> <li>v. Setting of igniting timing.</li> <li>vi. Advancing spark.</li> </ol> </li> <li>• Write the procedure to check igniting timing with timing gun.</li> <li>• Define electronic ignition system.</li> <li>• Describe computer controlled ignition system.</li> <li>• Define distributor less ignition system.</li> <li>• Describe coil on plug type ignition system.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Replace battery.</li> <li>2. Inspect and replace fuse.</li> <li>3. Insulate the wires/cables.</li> <li>4. Replace ignition coil and resister.</li> </ol>	<p><b>Total</b> 50 hours</p> <p><b>Theory:</b> 10 hours</p> <p><b>Practical:</b> 40 hours</p>	<ul style="list-style-type: none"> <li>• Battery charger</li> <li>• Combination spanner set.</li> <li>• Multimeter.</li> <li>• Screw driver set.</li> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Filler gauge.</li> <li>• Spark plug cleaner and tester.</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Spark plug</li> <li>• Carburetor cleaner</li> <li>• W.D-40</li> <li>• C,B. Point</li> </ul>	<ul style="list-style-type: none"> <li>• Engine lab</li> <li>• Classroom</li> </ul>

	<p>specified function.</p> <ul style="list-style-type: none"> <li>• Replace ignition switch according to standard specifications.</li> <li>• Replace faulty parts of distributor (C.B. point and condenser).</li> <li>• Change High tension cables to ensure smooth functioning of ignition system, if needed.</li> <li>• Replace/clean and adjust spark plugs to required measurements and function.</li> </ul>	<ol style="list-style-type: none"> <li>5. Replace ignition switch.</li> <li>6. Replace C.B point and condenser.</li> <li>7. Replace H.T cables according to the firing order.</li> <li>8. Clean Adjust and replace Spark plug.</li> </ol>		<ul style="list-style-type: none"> <li>• Condenser</li> <li>• High tension lead</li> <li>• Distributer cap</li> <li>• Rotor</li> <li>• Insulation tap</li> <li>• Fuse</li> <li>• Auto wire</li> <li>• Distilled water</li> <li>• Wire grips (connectors)</li> <li>• Cotton waste</li> </ul>	
--	--	---	--	---	--

## Module 4: Repair Fuel System (Carburetor)

**Objective of the module:** This Module is designed to provide skills and knowledge to repair fuel system (Carburetor) by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to diagnose faults of fuel system and repair /replace parts of fuel system, carefully applying the tools and equipment according to SOPs.

**Duration:** 100Hours      **Theory:** 20Hours      **Practical:** 80Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults in Fuel System (Carburetor)	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Check fuel tank, filter and Fuel lines</li> <li>• identify fault/s according to set standards</li> <li>• Check Fuel pump pressure</li> <li>• identify fault/s in fuel supply to Carburetor according to set standards</li> <li>• Check Fuel pump operating function by camshaft</li> <li>• Check and identify fault/s to ensure the proper functioning of Carburetor</li> </ul>	<ul style="list-style-type: none"> <li>• Occupational Health &amp; Safety (OHS) precautions</li> <li>• Understanding of Manufacturer Repair Manual</li> <li>• Carburetor circuits and Auxiliary System</li> <li>• Octane Numbering of fuel</li> <li>• Define fuel system</li> <li>• Enlist components of fuel supply system.</li> <li>• Describe the construction of tank</li> <li>• Describe fuel line</li> <li>• Describe fuel filter</li> <li>• Define fuel pump</li> <li>• Enlist of types of fuel pump</li> <li>• Explain the construction and operation of mechanical fuel feed pump</li> <li>• Explain the construction and operation of electrical fuel feed pump</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Replace fuel tank</li> <li>2. Replace fuel filter</li> <li>3. Replace fuel line</li> </ol>	<p><b>Total</b> 26 Hours</p> <p><b>Theory:</b> 06 Hour</p> <p><b>Practical:</b> 20 Hours</p>	<ul style="list-style-type: none"> <li>• Socket set</li> <li>• Hammer</li> <li>• Screw driver Philip and flat.</li> <li>• Combination spanner</li> <li>• Combination plier</li> <li>• Nose pliers</li> <li>• Vehicle</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Cotton waste</li> <li>• Kerosene oil</li> <li>• W.D-40</li> <li>• PPEs</li> </ul>	Engine overhauling lab

<p><b>LU2:</b> Remove Faults in Fuel System (Carburetor)</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace faulty fuel tank/filter/ lines to ensure accurate functioning of vehicle</li> <li>• Replace faulty Fuel Pump to ensure the proper functioning of fuel supply to Carburetor</li> <li>• Repair and adjust fault/s in Carburetor to ensure the proper air fuel mixture supply to engine for smooth functioning of engine</li> </ul>	<ul style="list-style-type: none"> <li>• Define carburetor</li> <li>• Describe the function of carburetor such as             <ol style="list-style-type: none"> <li>I. Fuel atomization</li> <li>II. Control mixture ratio</li> <li>III. Control engine RPM</li> </ol> </li> <li>• Describe the working principle of carburetor.</li> <li>• Explain the construction of carburetor</li> <li>• Enlist the types of carburetor circuit</li> <li>• Explain the construction and operation of Float circuit</li> <li>• Explain the construction and operation of idle speed circuit</li> <li>• Explain the construction and operation of low speed circuit</li> <li>• Explain the construction and operation of high speed circuit</li> <li>• Explain the construction and operation of power circuit</li> <li>• Explain the construction and operation of acceleration pump circuit</li> <li>• Explain choke system</li> <li>• Enlist the types of choke system             <ol style="list-style-type: none"> <li>I. Manual choke</li> <li>II. Semiautomatic choke</li> <li>III. Automatic choke</li> </ol> </li> <li>• Describe the multiple carburetor</li> <li>• Describe the purpose of carburetor</li> <li>• Describe the purpose of manifold. Carburetor</li> </ul> <p><b>Practical activity</b></p> <ul style="list-style-type: none"> <li>• Check fuel pump, identify and check fuel supply to carburetor.</li> <li>• Adjust air fuel ratio</li> </ul>	<p><b>Total</b> 74 Hours</p> <p><b>Theory:</b> 14 Hour</p> <p><b>Practical:</b> 60 Hours</p>	<ul style="list-style-type: none"> <li>• Socket set</li> <li>• Hammer</li> <li>• Screw driver Philip and flat.</li> <li>• combination spanner</li> <li>• combination plier</li> <li>• Nose pliers</li> <li>• Vehicle</li> <li>• Tachometer</li> <li>• Exhaust gas analyzer</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Cotton waste</li> <li>• Kerosene oil</li> <li>• Carburetor cleaner</li> <li>• PPEs</li> <li>• Carburetor kit</li> </ul>	<p>Engine overhauling lab</p>
--	--	---	--	--	-------------------------------



		<ul style="list-style-type: none"><li>• Check fuel pump operation function by camshaft</li><li>• Check function of carburetor and identify fault.</li></ul>			
--	--	---	--	--	--

## Module 5: Perform Service of Electronic Fuel Injection Systems

**Objective of the module:** This Module is developed to provide skills and knowledge to service the Electronic Fuel Injection (EFI) System by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to diagnose fuel system problems of vehicle and fuel metering

**Duration:** 180Hours      **Theory:** 36Hours      **Practical:** 144Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1: Diagnose Faults in EFI System</b>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Diagnose component fault/s through specified vehicle diagnostic tool/scanner</li> <li>Check fuel pressure with the help of fuel pressure gauge to verify the functioning as per given standards</li> <li>Check wiring circuit and fuel injector with the help of multi-meter to ensure standard operation</li> </ul>	<ul style="list-style-type: none"> <li>Define electronic fuel injection system</li> <li>Enlist the main components of EFI system</li> <li>Explain idle control valve</li> <li>Enlist types of sensors use in EFI system</li> <li>Describe the construction of fuel supply system</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>Measure the fuel pressure with the help of gauge</li> <li>Measure the resistance of the sensors and check continuity of different sensors such as IAT Sensor, ECT sensor, TP sensor, CKP and CMP sensor.</li> <li>Measure the resistance of injectors.</li> <li>Trace of the fault by using engine diagnostic scanner</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hour</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>Socket set</li> <li>Combination scanner</li> <li>Open end spanner</li> <li>Ring spanner</li> <li>Screw driver</li> <li>Multi-meter</li> <li>Scanner</li> <li>Vehicle</li> </ul> <p><b>Consumable</b></p> <ul style="list-style-type: none"> <li>IAT Sensor</li> <li>ECT sensor, TP sensor</li> <li>CKP sensor</li> <li>CMP sensor.</li> <li>MAP sensor</li> <li>Knock sensor</li> <li>Idle air control valve</li> <li>Fuel injectors</li> <li>ECM</li> <li>Petrol</li> <li>Kerosene oil</li> <li>Carb. cleaner</li> </ul>	Engine overhauling workshop

<p><b>LU2:</b> Perform Service of the EFI System</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace clogged/contaminated Fuel Filter, Fuel Tank and Fuel Pump Strainer</li> <li>• Ensure fuel pump pressure according to Standard specifications</li> <li>• Clean clogged/contaminated Fuel Injector, if needed</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the construction of electric fuel pump</li> <li>• Describe the construction and operation of pressure regulator</li> <li>• Describe the construction and operation of fuel injector</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Replace the fuel feed pump, fuel filter, pressure regulator</li> <li>2. Check and service of fuel injectors</li> <li>3. Replace faulty fuel injectors</li> <li>4. Replace faulty sensors</li> <li>5. Service throttle body</li> <li>6. Replace idle speed control valve</li> <li>7. Adjust TP sensors</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hour</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Socket set</li> <li>• Combination scanner</li> <li>• Open end spanner</li> <li>• Injector cleaner</li> <li>• Fuel pressure gauge</li> <li>• Ring spanner</li> <li>• Screw driver</li> <li>• Multi-meter</li> <li>• Scanner</li> <li>• Vehicle</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Kerosene oil</li> </ul>	<p>Engine overhauling workshop</p>
<p><b>LU3:</b> Perform Service of the Common Rail Diesel Fuel Injection System</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace clogged/contaminated diesel fuel filter and diesel fuel pump strainer, if needed</li> <li>• Ensure diesel fuel pump pressure according to Standard specifications; replace, if needed</li> <li>• Replace clogged/contaminated diesel fuel injector</li> </ul>	<ul style="list-style-type: none"> <li>• Define the diesel fuel supply system</li> <li>• Enlist the main components of fuel supply system</li> <li>• Enlist the types of fuel injection pump</li> <li>• Explain the construction and operation of Inline fuel injection pump</li> <li>• Explain the construction and operation of distributor types fuel injection pump</li> <li>• Describe the construction and operation of diesel fuel injectors</li> <li>• Describe airlock in diesel fuel supply system</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Replace the diesel fuel filter</li> <li>2. Service of Inline fuel injection pump</li> <li>3. Service of distributor type fuel injection pump</li> <li>4. service of diesel fuel injectors</li> <li>5. Remove the airlock from diesel fuel</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hour</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Socket set</li> <li>• Combination scanner</li> <li>• Open end spanner</li> <li>• Ring spanner</li> <li>• Screw driver</li> <li>• Vehicle</li> <li>• Diesel injector</li> <li>• Diesel injector tester</li> <li>• Diesel pump test bench</li> <li>• Diesel fuel injection pump (inline, rotary)</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Cotton waste</li> <li>• Kerosene oil</li> </ul>	<p>Auto Diesel Lab</p>

		supply system.		<ul style="list-style-type: none"><li>• PPEs</li><li>• Diesel fuel</li></ul>	
--	--	----------------	--	--	--

## Module 6: Repair Engine Cooling System

**Objective of the module:** This module is developed to provide skills and knowledge to service and repair air and water cooled engine cooling systems, in accordance with the Manufacturer Manual. You will be able to diagnose fault/s and other maintenance issues of automobile engines while ensuring safe use of tools, equipment and materials.

**Duration:** 100 Hours    **Theory:** 20 Hours    **Practical:** 80 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Fault in Engine Cooling System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Carry out inspection of radiator, cooling fan/ motor to diagnose fault/s, if any</li> <li>Check Coolant for contamination and diagnose fault/s, if any</li> <li>Carry out inspection to check Water temperature gauge, and sensor and diagnose fault/s, if any</li> <li>Carry out inspection to check V belt/ condition and its tension to verify smooth functionality of water pump belt and diagnose fault/s, if any</li> <li>Carry out inspection to check Vacuum/</li> </ul>	<ul style="list-style-type: none"> <li>Define cooling system and its types               <ol style="list-style-type: none"> <li>Air cool system</li> <li>Water cool system</li> </ol> </li> <li>Describe the components of cooling system</li> </ul> <p><b>Practical Activities</b></p> <p>Arrange tools for diagnose faults in engine cooling system</p> <p>Inspect and diagnose cooling system and its component for performance and leakages</p> <ol style="list-style-type: none"> <li>Radiator</li> <li>Cooling fan</li> <li>Water pump</li> <li>Thermostat valve</li> <li>Water hoses</li> <li>Engine coolant temperature sensor (ECT)</li> <li>Temperature gauge</li> <li>Belts</li> <li>Heater core</li> </ol>	<p><b>Total</b> 50 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 40 Hours</p>	<ul style="list-style-type: none"> <li>Service manual</li> <li>Scanner</li> <li>Radiator pressure tester</li> <li>Screw driver set (Philips + Flat)</li> <li>Combination spanner set</li> <li>Combination pillar</li> <li>Nose pillar</li> </ul>	<p><b>Theory:</b> Class room</p> <p><b>Practical:</b> Workshop</p>

	<p>pressure valve in radiator cap with appropriate tool, to verify recommended pressure</p> <ul style="list-style-type: none"> <li>• Carry out inspection to check heat units and accessories of Passenger compartment, to verify leakage</li> </ul>				
<p><b>LU2:</b> Repair or Replace radiator and Auxiliary Components</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Adjust water pump belt tension to verify proper functioning of coolant system according to requirement</li> <li>• Replace faulty radiator pressure cap according to set standards</li> <li>• Replace faulty radiator reservoir to maintain recommended coolant level in the cooling</li> <li>• Replace faulty thermostat valve to maintain the temperature of coolant at 90° C to 97° C</li> </ul>	<ul style="list-style-type: none"> <li>• Define the working possess of water pump</li> <li>• Explain the propose of thermostat valve in engine cooling system</li> <li>• Define the radiator fan types and its working</li> <li>• Explain the importance of coolant in engine coolant system.</li> </ul> <p><b>Practical Activities</b></p> <ul style="list-style-type: none"> <li>• Arrange tools for Repair or Replace faults in engine cooling system</li> <li>• Identify faults in engine cooling system for repair or replace faulty parts or components</li> </ul> <ol style="list-style-type: none"> <li>1. Adjust water pump belt tension</li> <li>2. Replace radiator or its faulty components</li> <li>3. Replace or inspect thermostat valve working</li> <li>4. Servicing of radiator assembly</li> <li>5. Replace water pump</li> <li>6. Inspect and replace of radiator coolant</li> </ol>	<p><b>Total</b> 50 Hours</p> <p><b>Theory:</b> 10 Hour</p> <p><b>Practical:</b> 40 Hours</p>	<ul style="list-style-type: none"> <li>• Service manual</li> <li>• Scanner</li> <li>• Radiator pressure tester</li> <li>• Screw driver set (Philips + Flat)</li> <li>• Combination spanner set</li> <li>• Combination pillar</li> <li>• Nose pillar</li> </ul> <p><b>Consumable Items</b></p> <ul style="list-style-type: none"> <li>• Radiator Coolant</li> <li>• Radiator assembly</li> <li>• Water hoses</li> <li>• Hoses clamp</li> <li>• Silicone tube</li> <li>• Water pump</li> <li>• Water pump gas kit</li> <li>• Thermostat valve</li> </ul>	<p><b>Practical:</b> Workshop</p>

	<ul style="list-style-type: none"> <li>• Perform Flushing of contamination from clogged radiator without damaging the radiator core</li> <li>• Remove faulty water circulating pump to verify proper circulation of coolant in cooling system</li> </ul>			<ul style="list-style-type: none"> <li>• Radiator cap</li> <li>• Grease</li> <li>• Water temperature gauge</li> <li>• Water temperature sensor</li> <li>• Fan belt</li> <li>• Radiator fan motors</li> <li>• Radiator fan</li> <li>• Radiator Fan shroud</li> </ul>	
--	--	--	--	---	--

## Module 7: Repair Engine Lubrication System

**Objective of the module:** This module is developed to provide skills and knowledge to service and repair different types of engine lubricating systems, in accordance with the Manufacturer Manual. You will be able to diagnose fault/s and other maintenance issues of automobile engines while ensuring safe use of tools, equipment and materials

**Duration:** 120 hours      **Theory:** 24 hours      **Practical:** 96 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults in Lubrication System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Check engine oil level and condition.</li> <li>• Inspect oil pressure warning lamp/gauge according to manufacturer specifications.</li> <li>• Inspect oil/sump/combustion chambers/ cooling system for oil leakage and find dents or damages, if any.</li> </ul>	<ul style="list-style-type: none"> <li>• Define Lubrication system.</li> <li>• Enlist Types of Lubrication System.</li> <li>• Differentiate between Splash System and Pressure feed lubrication System.</li> <li>• Explain Combined Splash and pressure feed System.</li> <li>• Enlist Advantages of lubrication System.</li> <li>• Write Characteristics of Engine oil.</li> <li>• Describe different Terminologies of Lubricating oil.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Inspect Engine oil level and its condition.</li> <li>2. Inspect Oil Pressure Warning Lamp and Oil Pressure Gauge.</li> <li>3. Inspect oil Sump condition.</li> <li>4. Remove and Fit oil Cooler.</li> </ol>	<p><b>Total</b> 60 hours</p> <p><b>Theory:</b> 12 hours</p> <p><b>Practical:</b> 48 hours</p>	<ul style="list-style-type: none"> <li>• Oil Pressure Tester</li> <li>• Universal Strap Wrench/Oil Filter Spanner.</li> <li>• Screw driver Set.</li> <li>• Combination Spanner set.</li> <li>• Combination Plier.</li> <li>• Nose Plier.</li> <li>• Socket Set.</li> </ul> <p><b>Consumable</b></p> <ul style="list-style-type: none"> <li>• Cotton Waste</li> </ul>	<ul style="list-style-type: none"> <li>• Engine Lab.</li> <li>• Class Room.</li> </ul>
<b>LU2:</b> Repair or Service Engine Lubrication System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace Engine Oil and Oil Filter to verify smooth functioning of engine.</li> <li>• Replace engine oil pressure switch to</li> </ul>	<ul style="list-style-type: none"> <li>• Define Oil filter and oil pump.</li> <li>• Explain types of oil pump.</li> <li>• Describe purpose of pressure relief valve.</li> <li>• Explain oil flow circuit</li> <li>• Write purpose of PCV system.</li> <li>• Change oil and filter.</li> <li>• Check and Replace oil Pressure switch.</li> </ul>	<p><b>Total</b> 60 hours</p> <p><b>Theory:</b> 12 hours</p> <p><b>Practical:</b></p>	<ul style="list-style-type: none"> <li>• Oil pressure tester</li> <li>• Universal strap wrench/filter spanner</li> <li>• Screw driver set</li> <li>• Combination</li> </ul>	<ul style="list-style-type: none"> <li>• Engine Lab.</li> <li>• Class Room.</li> </ul>



	<p>maintain standard engine oil pressure in the system.</p> <ul style="list-style-type: none"> <li>• Dismantle oil sump, repair or replace oil pump to remove any damage according to manufacturer specifications.</li> </ul>	<ul style="list-style-type: none"> <li>• Remove and refit oil sump.</li> <li>• Dismantle oil pump from engine.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Change engine oil and oil filter.</li> <li>2. Check and replace oil pressure switch.</li> <li>3. Remove and refit oil sump from engine.</li> <li>4. Remove and install oil pump of engine.</li> </ol>	48 hours	<p>spanner set.</p> <ul style="list-style-type: none"> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Multimeter/ test lamp.</li> </ul> <p><b>Consumable</b></p> <ul style="list-style-type: none"> <li>• Oil filter</li> <li>• Engine oil</li> <li>• Cotton waste</li> </ul>	
--	---	--	----------	--	--

## Module 8: Perform Overhauling of Engine

**Objective of the module:** This Module is developed to provide skills and knowledge to Overhaul Engine (Petrol and Diesel), in accordance with the Manufacturer Manual. You will be able to diagnose fault/s and other maintenance issues of automobile engines while ensuring safe use of tools equipment and materials.

**Duration:** 240 hours    **Theory:** 48 Hours    **Practical:** 192 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Inspect Engine of the Vehicle	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Carryout compression test to check the engine performance according to standards</li> <li>Identify leakages in engine for oil/coolant by following standard procedure</li> <li>Drain engine oil and coolant as per standard procedure</li> </ul>	<ul style="list-style-type: none"> <li>Define blow by</li> <li>Enlist the causes of engine overheating</li> <li>Enlist the causes of engine missing.</li> <li>Enlist the causes of lack of engine power.</li> <li>Enlist the causes of black smoke in engine exhaust.</li> <li>Enlist the causes of excessive oil consumption</li> <li>Describe the reason of blown head gasket.</li> <li>Describe the reason of broken piston rings</li> <li>Describe the reason of bending connecting rod.</li> <li>Describe the reason of burn engine valves head</li> <li>Describe the reason of bending engine valve.</li> <li>Describe the reason of broke piston crown.</li> <li>Describe the reason of broken crank shaft.</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>Measure the compression pressure of engine cylinder.</li> </ol>	<p><b>Total</b> 50 hours</p> <p><b>Theory:</b> 10 hours</p> <p><b>Practical:</b> 40 hours</p>	<ul style="list-style-type: none"> <li>Vehicle with workshop manual</li> <li>Compression Gauge.</li> <li>Vacuum Gauge</li> <li>Radiator Pressure Tester</li> <li>Tool Kit (Hand tools)</li> </ul> <p><b>Consumable items:</b></p> <ul style="list-style-type: none"> <li>Cotton Rag.</li> </ul>	Engine Lab/workshop

		<ol style="list-style-type: none"> <li>2. Check the engine condition by using vacuum tester.</li> <li>3. Check the engine condition by using engine leakage tester.</li> <li>4. Detect engine noise by using auto stethoscope</li> <li>5. Inspect the engine oil leaking point</li> <li>6. Inspect the engine coolant leaking point</li> </ol>			
<b>LU2:</b> Remove Engine from the Vehicle	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Disconnect relevant electrical connections of engine as per standard procedure</li> <li>• Remove auxiliary components of engine as per standard procedure</li> <li>• Remove engine from the vehicle for overhauling according to standard procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the purpose of cooling system</li> <li>• Describe the purpose of lubrication system</li> <li>• Describe the purpose of accelerator cable</li> <li>• Describe the purpose of clutch cable.</li> <li>• Describe the purpose of gear shift linkage.</li> <li>• Describe the purpose of engine mounting</li> <li>• Enlist the external leakage point of engine and gear box</li> <li>• Enlist the external leakage point of cooling system</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Remove and check the condition of battery, battery cable, battery terminal</li> <li>2. Remove and check the condition of radiator hose pipe radiator fan .fan belt</li> <li>3. Remove and check the condition of clutch cable accelerator cable and gear shift lever bush</li> </ol>	<p><b>Total</b> 48 hours</p> <p><b>Theory:</b> 08 hours</p> <p><b>Practical:</b> 40 hours</p>	<ul style="list-style-type: none"> <li>• Tool kit (hand tools)</li> <li>• Hydraulic jack</li> <li>• Engine hoist</li> <li>• Safety stands.</li> <li>• Wheel Spanner.</li> <li>• Two post lift.</li> </ul> <p><b>Consumable items:</b></p> <ul style="list-style-type: none"> <li>• Cotton rag.</li> <li>• Gloves.</li> <li>• Kerosene oil</li> </ul>	Engine Lab/workshop

		<ol style="list-style-type: none"> <li>4. Remove and Check the condition of clutch plate pressure plate release bearing fly wheel and gear box seals.</li> <li>5. Remove and check the condition of fan belt radiator hose pipe radiator fan</li> <li>6. Remove and check the condition of high tension leads spark plugs CB point</li> <li>7. Remove and check the condition of engine mounting</li> </ol>			
<p><b>LU3:</b> Dismantle the Components of the Engine</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Mount engine on engine overhauling trolley as per standards</li> <li>• Dismantle engine components to identify faults as per Manufacturer Repair Manual</li> <li>• Mark engine components and identify their fixing order or the place</li> <li>• Clean all parts of engine for repair as per standard procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Describe ovality and tapperness in cylinder.</li> <li>• Describe the importance of engine valve clearance.</li> <li>• Define detonation</li> <li>• Describe the causes of detonation in petrol engine</li> <li>• Describe the reason of detonation</li> <li>• Define preignition</li> <li>• Describe the reason of preignition</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Remove and inspect the condition of timing belt timing bear and gears.</li> <li>2. Remove cylinder head from engine</li> <li>3. Disassemble cylinder head assembly</li> <li>4. Inspect the condition of cam and cam bush.</li> <li>5. Inspect the condition of cylinder head for crack, valve seat damage, valve guide damage.</li> <li>6. Inspect and check the components of valve assembly</li> <li>7. Remove engine pistons and check the condition of pistons piston rings and</li> </ol>	<p><b>Total</b> 54 hours</p> <p><b>Theory:</b> 10 hours</p> <p><b>Practical:</b> 44 hours</p>	<ul style="list-style-type: none"> <li>• Repair manual</li> <li>• Engine Stand.</li> <li>• Tool Kit (Hand Tools)</li> <li>• Working bench</li> <li>• Washing Tray</li> <li>• Valve spring compressor tool.</li> </ul> <p><b>Consumable Items:</b></p> <ul style="list-style-type: none"> <li>• Kerosene oil.</li> <li>• Cotton Rag</li> <li>• Gloves.</li> </ul>	<p>Engine Lab / workshop</p>

		<p>connecting rods</p> <ol style="list-style-type: none"> <li>8. Measure the tapperness and ovality of engine cylinders.</li> <li>9. Remove oil pump and check clearance between oil pump parts.</li> <li>10. Remove fly wheel and check the condition of fly wheel</li> <li>11. Remove crank shaft and check the condition of crank shaft and main bearing cap and main bearings</li> <li>12. Check the condition of cylinder block</li> </ol>			
<p><b>LU4: Repair the Engine</b></p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Check engine cylinder head (Cam Shaft, Valve Set and Valve Seat) to repair/replace, if required</li> <li>• Take measurements for machining of engine components (Crank Shaft, Cam Shaft and Engine Block) as per standards</li> <li>• Reassemble engine with specified torque as per standard procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Describe valve seat, valve head and its angle</li> <li>• Difference between boring and honing</li> <li>• Describe the importance of cylinder honing.</li> <li>• Differentiate between cylinder lining and cylinder sleeve.</li> <li>• Difference standard bearing and under size bearing.</li> <li>• Difference between standard piston and oversize piston.</li> <li>• Describe importance of valve seals</li> <li>• Describe the reason of taper ness and ovality</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Boring and honing the engine cylinder</li> <li>2. Lapping the cylinder head valves</li> <li>3. Grinding the crank shaft main and big end journals</li> <li>4. Replace the small end bush</li> <li>5. Replace the cam shaft bush</li> <li>6. Check and replace the oil pump kit.</li> <li>7. Service the cylinder block</li> </ol>	<p><b>Total</b> 48 hours</p> <p><b>Theory:</b> 10 hours</p> <p><b>Practical:</b> 38 hours</p>	<ul style="list-style-type: none"> <li>• Vernier Caliper.</li> <li>• Micrometer</li> <li>• Scale</li> <li>• Feeler Gauge.</li> <li>• Repair manual</li> <li>• Torque wrench</li> <li>• Tool kit (hand tools)</li> <li>• Piston Ring Compressor Tool.</li> <li>• Valve spring compressor tool.</li> </ul> <p><b>Consumable items:</b></p> <ul style="list-style-type: none"> <li>• Kerosene oil.</li> <li>• Petrol.</li> <li>• Cotton Rag.</li> <li>• Overhauling kit</li> <li>• Valve set</li> <li>• Valve guide set</li> <li>• Valve seal set</li> <li>• Piston set</li> <li>• Piston ring set</li> <li>• Thrust washers</li> </ul>	<p>Engine Lab/Workshop</p>

		8. Service the cylinder head 9. Service the crank shaft 10. Service the rocker arm assembly		set <ul style="list-style-type: none"> <li>• Timing belt and bearing.</li> <li>• Alternator and ac belts.</li> <li>• Engine oil</li> <li>• Engine coolant.</li> <li>• Oil filter.</li> <li>• Air filter.</li> <li>• Clutch set.</li> <li>• Silicon tube.</li> <li>• Gear oil.</li> <li>• Axle seal set.</li> <li>• House pipe.</li> <li>• Flywheel bearing.</li> <li>• Water pump.</li> <li>• Oil pump.</li> </ul>	
<b>LU5:</b> Re-fit Engine in the Vehicle	<b>The trainee will be able to:</b> <ul style="list-style-type: none"> <li>• Refit engine on vehicle, fill engine oil and radiator coolant to required level</li> <li>• Check supply lines from fuel, air, and coolant etc.</li> <li>• Reconnect relevant engine electrical connections of battery and wire harness</li> <li>• Vehicle test run as per SOPs and final</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the importance of engine valve clearance.</li> <li>• Describe the importance of piston ring side clearance and end gap</li> <li>• Describe the importance of proper clearance between cylinder and piston</li> <li>• Describe the proper location of piston rings end gap</li> <li>• Differentiate between thrust side and pin side.</li> <li>• Describe the methods of fitting piston pin fitting</li> <li>• Describe crust height</li> <li>• Describe the importance of proper clearance of main bearings</li> <li>• Describe the importance of thrust</li> </ul>	<b>Total</b> 40 hours  <b>Theory:</b> 10 hours  <b>Practical:</b> 30 hours	<ul style="list-style-type: none"> <li>• Tool Kit (Hand Tool).</li> <li>• Repair manual</li> <li>• Torque wrench</li> <li>• Engine Scanner.</li> <li>• Multimeter.</li> </ul> <b>Consumable Items:</b> <ul style="list-style-type: none"> <li>• Grease.</li> <li>• Cotton Rag.</li> <li>• Gloves.</li> <li>• Engine oil.</li> <li>• Gear oil.</li> <li>• Engine coolant.</li> <li>• Oil filter</li> <li>• Air filter.</li> </ul>	Engine Lab/workshop

	adjustments if necessary; ensure proper working condition	clearance of crank shaft. <b>Practical activity</b> 1. Check the clearance of main bearing and big end bearing 2. Fit the crank shaft 3. Check the side clearance and piston end gap 4. Fit the engine piston 5. Assemble the cylinder head 6. Assemble 7. Fit the cylinder head 8. Fit the timing belt and bearing. 9. Adjust the valve clearance 10. Adjust the ignition timing 11. Fitting engine in vehicle			
--	--	---	--	--	--

## Module 9: Repair Manual Transmission System

**Objective of the module:** This module is designed to provide skills and knowledge to repair manual transmission of vehicle by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to diagnose faults related to transmission system of vehicle and repair faulty part/s according to set standards.

**Duration:** 180 Hours      **Theory:** 30 Hours      **Practical:** 150 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Diagnose Faults in Manual Transmission System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Check clutch mechanism (paddle, linkage etc.), hydraulic clutch fluid conditions and leakage, according to specified standards, and diagnose faults, if any</li> <li>Check gear mechanism (linkage bushes and bearings, shafts of gears, differential etc.), oil level and leakage according to the specified standards, and diagnose faults, if any</li> <li>Check Gear box mounts and diagnose faults, if any</li> <li>Disassemble transmission to</li> </ul>	<ul style="list-style-type: none"> <li>Describe the purpose of clutch.</li> <li>Describe the working principle of mechanical clutch</li> <li>Enlist the main components of clutch assemble</li> <li>Describe the purpose of clutch components.</li> <li>Describe the purpose of transmission</li> <li>explain the construction of synchromesh type gear box</li> <li>Describe working principle of synchromesh type gear box.</li> <li>Explain the construction of transaxle.               <ul style="list-style-type: none"> <li>Describe types of gears                   <ol style="list-style-type: none"> <li>Helical gear</li> <li>Spiral gear</li> <li>Crown gear</li> <li>Bevel gear</li> <li>Spur gear</li> <li>Herringbone</li> </ol> </li> </ul> </li> </ul> <p><b>Practical Activity:</b></p> <ol style="list-style-type: none"> <li>Check and adjust the free play of clutch pedal.</li> <li>Check and service the hydraulic clutch</li> </ol>	<p><b>Total:</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>vehicle</li> <li>stethoscope</li> </ul>	Engine / transmission rebuild shop/room



	diagnose faults, if any	<p>components.</p> <ol style="list-style-type: none"> <li>3. Check and replace the release bearing</li> <li>4. Check and replace the clutch plate</li> <li>5. Check and replace the pressure plate.</li> <li>6. Check and service the coil spring type pressure plate.</li> <li>7. Check and service the synchromesh type gear box</li> </ol>			
<b>LU2:</b> Repair Manual Transmission System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Maintain or change hydraulic clutch paddle fluid of clutch according to specified level</li> <li>• Repair or replace any defected part/s according to specified standards, after performing vehicle test on road for checking slipping, abnormal noise, vibrations etc.</li> <li>• Replace clutch set (clutch and pressure plate, clutch release bearing) and repair related components according to specified standards, if required</li> <li>• Repair or replace faulty part/s of transmission gear</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the reason of following clutch problems. <ol style="list-style-type: none"> <li>I. Clutch slippage</li> <li>II. Dag and binding</li> <li>III. Chatter</li> <li>IV. Pedal pulsation</li> <li>V. Vibration</li> <li>VI. Noise</li> </ol> </li> <li>• Describe the reason of following transmission problems <ol style="list-style-type: none"> <li>I. Gear clash when shifting from one gear to another</li> <li>II. Clicking noise in any one gear range</li> <li>III. Does not shift into one gear</li> <li>IV. Locked in one gear cannot be shifted out of that gear</li> <li>V. Slips out of gear</li> <li>VI. Rough growling noise when engine operating with transmission/ transaxle in neutral</li> <li>VII. Vehicle moving—rough growling noise in transmission—</li> <li>VIII. Noise heard in all gears except direct drive</li> <li>IX. Transmission/transaxle shifts hard</li> </ol> </li> </ul> <p><b>Practical activity</b></p>	<p><b>Total:</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Complete tool kit</li> <li>• Snap ring pliers</li> <li>• Sealant gun</li> <li>• Seal extractor</li> <li>• Bearing puller</li> <li>• Gear puller</li> <li>• Safety stand/ two post lift</li> <li>• Air compressor</li> <li>• Creeper</li> <li>• Trolley jack</li> <li>• SST (Special service tools)</li> <li>• Stethoscope</li> </ul> <p><b>Consumable</b></p> <ul style="list-style-type: none"> <li>• Clutch cables</li> <li>• Clutch cylinders</li> <li>• Clutch fluids</li> <li>• Pressure plate</li> <li>• Clutch disc</li> <li>• Clutch bearings</li> </ul>	Engine / transmission rebuild shop/room

	<p>box according to specified standards</p>	<ol style="list-style-type: none"> <li>1. Check and service the locking mechanism of gear box</li> <li>2. Check and replace the synchronizing ring of gear box.</li> <li>3. Check and replace the bearing of gear box</li> <li>4. Check and replace the gears of transmission</li> <li>5. Check and replace the shifting mechanism of transmission</li> <li>6. Check and service the locking mechanism of transaxle.</li> <li>7. Check and replace the synchronizing ring of transaxle.</li> <li>8. Check and service the broken gear of transaxle.</li> <li>9. Remove and install the transaxle</li> <li>10. Remove and install the transmission</li> </ol>		<ul style="list-style-type: none"> <li>• Grease/ oil</li> <li>• Sealant</li> <li>• Transmission oil SAE 75W85</li> <li>• Dust cover of drive shaft</li> <li>• Universal joint cross</li> <li>• Cotton waste</li> <li>• Cotton gloves</li> <li>• Kerosene oil</li> <li>• Bolts kit</li> </ul>	
<p><b>LU3:</b> Repair auxiliary transmission components</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Repair or replace faulty part/s of propeller shafts according to specified standards</li> <li>• Repair or replace faulty components of differential according to specified standards</li> <li>• Repair or replace faulty axle according to specified standards</li> <li>• Repair or replace</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the purpose of propeller shaft.</li> <li>• Differentiate between slip joint and universal joint.</li> <li>• Describe the purpose of CV joint.</li> <li>• Describe the purpose of differential.</li> <li>• Describe the purpose of transfer case.</li> <li>• Describe the construction and operation of transfer case.</li> <li>• Describe the purpose of locking device</li> </ul> <p><b>Practical activity.</b></p> <ol style="list-style-type: none"> <li>1. Remove and install propeller shaft</li> <li>2. Remove and install the stub shaft from vehicle.</li> <li>3. Replace the universal joint.</li> <li>4. Replace the inner and outer CV joint.</li> <li>5. Remove and install the differential from vehicle.</li> </ol>	<p><b>Total:</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Complete tool kit</li> <li>• Snap ring pliers</li> <li>• Sealant gun</li> <li>• Seal extractor</li> <li>• Bearing puller</li> <li>• Gear puller</li> <li>• Safety stand/ two post lift</li> <li>• Air compressor</li> <li>• SST</li> </ul> <p>Stethoscope</p> <p><b>Consumable Items</b></p>	<p>Engine / transmission rebuild shop/room</p>

	<p>faulty seals and washers according to specified standards</p> <ul style="list-style-type: none"> <li>• Reassemble and install a transmission gearbox in a vehicle according to Manufacturer Manual</li> </ul>	<p>6. Service the differential 7. Check the back lash of final drive with the help of dial indicator.</p>	<ul style="list-style-type: none"> <li>• Clutch cables</li> <li>• Clutch cylinders</li> <li>• Clutch fluids</li> <li>• Pressure plate</li> <li>• Clutch disc</li> <li>• Clutch bearings</li> <li>• Grease/ oil</li> <li>• Sealant</li> <li>• Transmission oil SAE 75W85</li> <li>• Dust cover of drive shaft</li> <li>• Universal joint cross</li> <li>• Cotton waste</li> <li>• Cotton gloves</li> <li>• Kerosene oil</li> <li>• Bolts kit</li> </ul>	
--	--	---	--	--

## Module 10: Repair Automatic Transmission System

**Objective of the module:** This module is developed to provide skills and knowledge to repair Automatic Transmission System and ancillary components by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to diagnose faults in Automatic Transmission System of the vehicle and repair the same while using standard procedures.

**Duration:** 240 Hours    **Theory:** 60 Hours    **Practical:** 180 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults in Automatic Transmission System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Carry out road test at different speeds for smooth operations of torque converter and gear shifting according to Manufacturer standard</li> <li>Check automatic transmission mounts for faults if any</li> <li>Check automatic transmission fluid (ATF) level, according to standard specification and identify leaks if any</li> <li>Check automatic transmission solenoid by using automotive scanner and identify faults if any</li> </ul>	<ul style="list-style-type: none"> <li>Enlist the types of automatic transmission</li> <li>Enlist the main component of torque converter.</li> <li>Describe the working principle of torque converter.</li> <li>Describe the advantage of torque converter clutch</li> <li>Describe the purpose of selector lever and manual valve</li> <li>Describe planetary gear train</li> <li>Explain the working principle of planetary gear train.</li> <li>Describe the purpose of hydraulic system in automatic transmission</li> <li>Differentiate between conventional automatic transmission and ECT transmission</li> <li>Describe CVT transmission</li> <li>Enlist the main components of CVT</li> <li>Explain the construction and operation of CVT</li> </ul> <p><b>Practical Activity:</b></p> <ol style="list-style-type: none"> <li>Perform the road test in the following drive position and diagnose fault if any</li> </ol>	<p><b>Total:</b> 110 Hours</p> <p><b>Theory:</b> 30 Hours</p> <p><b>Practical:</b> 80 Hours</p>	<ul style="list-style-type: none"> <li>Multi meter</li> <li>Scanner</li> <li>Stethoscope</li> </ul>	Engine / transmission rebuild shop/room

	<ul style="list-style-type: none"> <li>• Check electrical controls and Hydraulic pressure of automatic transmission for faults if any</li> </ul>	<ol style="list-style-type: none"> <li>(a) D position test</li> <li>(b) (b) 3 position test</li> <li>(c) Two position test</li> <li>(d) L position test</li> <li>(e) R position test</li> <li>(f) P position test</li> </ol> <ol style="list-style-type: none"> <li>2. Perform the following mechanical system tests <ol style="list-style-type: none"> <li>(a) Stall speed test</li> <li>(b) Shift time lag test</li> </ol> </li> <li>3. Perform hydraulic test</li> <li>4. Perform manual shifting test</li> </ol>			
<b>LU2:</b> Disassemble Automatic Transmission System and Ancillary Components	<b>The trainee will be able to:</b> <ul style="list-style-type: none"> <li>• Remove automatic transmission and disassemble it to check for worn-out/faulty part/s and replace them as per Manufacturer Repair Manual</li> <li>• Check automatic transmission performance by ensuring proper linkages and controls as per standards</li> <li>• Reassemble automatic transmission and refit to the vehicle according to standards</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the purpose of clutch in automatic transmission.</li> <li>• Describe the purpose of brake in automatic transmission.</li> <li>• Describe the purpose of brake band in automatic transmission.</li> <li>• Describe the purpose of one way clutch in automatic transmission.</li> <li>• Enlist the main component of clutch used in automatic transmission.</li> <li>• Enlist the main components of brake used in automatic transmission.</li> <li>• Enlist the main components of servo and accumulator used in automatic transmission.</li> <li>• Describe the purpose of valve body.</li> <li>• Describe the purpose of shift valve in valve body.</li> <li>• Describe the purpose of primary regulating valve in automatic transmission.</li> <li>• Differentiate between line pressure ,throttle pressure,</li> <li>• Describe the function of governor in automatic transmission.</li> </ul>	<b>Total:</b> 130 Hours  <b>Theory:</b> 30 Hours  <b>Practical:</b> 100 Hours	<ul style="list-style-type: none"> <li>• Complete tool kit</li> <li>• Snap ring pliers</li> <li>• Sealant gun</li> <li>• Seal extractor</li> <li>• Bearing puller</li> <li>• Gear puller</li> <li>• Safety stand/ two post lift</li> <li>• Air compressor</li> <li>• Multi meter</li> <li>• Scanner</li> <li>• Stethoscope</li> </ul> <b>Consumable Items</b> <ul style="list-style-type: none"> <li>• Transmission fluid</li> <li>• Mounts</li> <li>• Sealants</li> <li>• Solenoid valve rings</li> </ul>	Engine / transmission rebuild shop/room

		<ul style="list-style-type: none"> <li>• Describe the purpose of shift valve in automatic transmission. Describe the purpose of solenoid in automatic transmission.</li> </ul> <p><b>Practical activity</b></p> <ol style="list-style-type: none"> <li>1. Change transmission oil</li> <li>2. Check and replace the torque convertor.</li> <li>3. Check and service the oil pump</li> <li>4. Check and replace the shift position switch</li> <li>5. Check and service the clutch assembly of automatic transmission.</li> <li>6. Check and service the brake assembly of automatic transmission.</li> <li>7. Service the valve body of automatic transmission.</li> <li>8. Change the brake band of automatic transmission.</li> <li>9. Disassemble service and assemble the automatic transmission according to service manual.</li> </ol>		<ul style="list-style-type: none"> <li>• Seals</li> <li>• Cotton waste</li> <li>• Cotton gloves</li> <li>• Solenoid valves</li> <li>• Spools valves</li> <li>• Clutch disks</li> <li>• Kerosene oil</li> <li>• Washing tray</li> <li>• Round brush</li> <li>• Transmission filter</li> </ul>	
--	--	--	--	--	--

## Module 11: Repair Braking Systems

**Objective of the module:** This module is designed to provide skills and knowledge to repair brake system of vehicle by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to perform inspection and diagnosis of faults of the brake system of vehicle, and perform road test to verify the performance of the vehicle.

**Duration:** 100 hours      **Theory:** 20 hours      **Practical:** 80 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults of Braking System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Check brake indicator switches to identify fault.</li> <li>• Perform road test to verify the faults of Brake System, unusual wear, noise and operation according to SOPs.</li> <li>• Check standard brake fluid level and quality/aging.</li> <li>• Check brake lines and hoses to check brake fluid leaks.</li> <li>• Check and identify Parking Brake and Master Cylinder, Wheel Cylinder, Vacuum Booster Units, Air Booster Parking Brake System, Brake Indicator Switches, Cable Faults etc. as per set standards.</li> </ul>	<ul style="list-style-type: none"> <li>• Define brake system.</li> <li>• Enlist types of brake system.</li> <li>• Explain following parts of mechanical brake system               <ol style="list-style-type: none"> <li>1. Brake pedal and brake cable.</li> <li>2. Brake shoe expander.</li> <li>3. Brake adjuster.</li> <li>4. Brake compensator</li> <li>5. Brake drum.</li> <li>6. Brake shoes.</li> </ol> </li> <li>• Explain working of parking brake.</li> <li>• Explain working of ABS brake system.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Check brake indicator switches to identify faults.</li> <li>2. Perform road test to verify the parts of brake system, unusual wear, noise and operation according to SOPs.</li> <li>3. Check standard brake fluid level and quality.</li> <li>4. Check brake lines and hoses to check brake fluid leaks.</li> <li>5. Diagnose faults of parking brake, master cylinder, vacuum booster and wheel cylinder.</li> <li>6. Check and diagnose faults of ABS of</li> </ol>	<p><b>Total</b> 25 hours</p> <p><b>Theory:</b> 5 hours</p> <p><b>Practical:</b> 20 hours</p>	<ul style="list-style-type: none"> <li>• Car lift/hydraulic jack.</li> <li>• Combination spanner set.</li> <li>• Brake fluid tester.</li> <li>• Screw driver set</li> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Vehicle scanner.</li> <li>• Safety stands.</li> <li>• Multimeters.</li> <li>• Test lamp.</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehensive lab</li> <li>• Classroom</li> </ul>

	<ul style="list-style-type: none"> <li>Identify faulty components of Anti-Lock Braking System (ABS) (sensors, pump, controller, valves etc.) to identify faults.</li> </ul>	system.			
<b>LU2:</b> Perform Repair of the Braking System.	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Dismantle brake system components of building layout as per Manufacturer Specifications.</li> <li>Repair faults of Brake Lines and Hoses according to set standards.</li> <li>Inspect and repair/replace/adjust Brake Shoe / Drum, Calliper Washers, Dust Boots, Wheel Cylinder Washers, and Master Cylinder Washers according to the requirement of respective parts to ensure proper functioning of Brake System.</li> <li>Replace or repair Brake Disc Rotor and Brake Drum according to set standards.</li> <li>Refill Brake Fluid level</li> </ul>	<ul style="list-style-type: none"> <li>Define hydraulic brake.</li> <li>Describe principle of hydraulic brake.</li> <li>Enlist parts of hydraulic brake.</li> <li>Describe the types of hydraulic brake.</li> <li>Define Brake pulling.</li> <li>Explain brake bleeding process.</li> <li>Write function of Air pressure brake.</li> <li>Describe the disc runout and repairing procedure by turning the disc</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>Dismantle and refit brake system components.</li> <li>Repair brake indicator switches.</li> <li>Repair brake lines and rubber hoses.</li> <li>Repair and replace master cylinder.</li> <li>Repair and adjust parking brake.</li> <li>Perform drum brake servicing and brake shoes replacement.</li> <li>Perform refill brake fluid at proper level.</li> <li>Replace brake light switch.</li> <li>Repair and replace brake booster.</li> <li>Perform disc brake servicing and disc pad replacement.</li> <li>Perform brake system air Bleeding</li> <li>Check disc runout and measure the disc thickness with micrometer.</li> </ol>	<p><b>Total</b> 25 hours</p> <p><b>Theory:</b> 5 hours</p> <p><b>Practical:</b> 20 hours</p>	<ul style="list-style-type: none"> <li>Hydraulic jack.</li> <li>Combination spanner set.</li> <li>Brake tester.</li> <li>Screw driver set.</li> <li>Combination plier.</li> <li>Nose plier.</li> <li>Socket set.</li> <li>Vehicle scanner.</li> <li>Air blow gun</li> <li>Wire brush</li> <li>Air bleeding jar</li> <li>Micrometer</li> <li>Dial gauge</li> <li>Viener caliper</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>Brake fluid</li> <li>Sand paper</li> <li>Disc pad</li> <li>Brake shoes</li> <li>Wheel cylinder kit</li> <li>Master cylinder kit</li> <li>Cotton rag</li> <li>Disc plate</li> <li>Brake drum</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive lab</li> <li>Classroom</li> </ul>



	<p>according to set standards.</p> <ul style="list-style-type: none"> <li>• Replace brake stop light switch according to set standards.</li> <li>• Perform road test to ensure the proper working of brake system.</li> </ul>			<ul style="list-style-type: none"> <li>• Grease</li> </ul>	
<p><b>LU3:</b> Diagnose faults of Anti-Lock Braking System (ABS).</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Perform road test to ensure proper working of ABS.</li> <li>• Identify faults of ABS Brake using vehicle scanner.</li> <li>• Visually check brake lines and hoses, blockage or crimping.</li> <li>• Inspect wheel speed sensor (proper mounting, connection or broken teeth).</li> <li>• Visually inspect ABS controller for any damages.</li> </ul>	<ul style="list-style-type: none"> <li>• Define Anti-lock braking system ABS.</li> <li>• Enlist parts of ABS system.</li> <li>• Explain Brake Actuator (ABS controller).</li> <li>• Write the purpose of wheel brake assembly.</li> <li>• Explain electronic control module.</li> <li>• Explain the following <ul style="list-style-type: none"> <li>I. Wheel speed sensor.</li> <li>II. ABS warning light.</li> <li>III. Brake assist warning light.</li> <li>IV. Stop light switch.</li> </ul> </li> <li>• Describe electronic brake force distribution system.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Perform road test to ensure proper working of ABS.</li> <li>2. Identify faults of ABS brake system by using scanner.</li> </ol>	<p><b>Total</b> 25 hours</p> <p><b>Theory:</b> 5 hours</p> <p><b>Practical:</b> 20 hours</p>	<ul style="list-style-type: none"> <li>• Vehicle equipped with ABS</li> <li>• Multimeter</li> <li>• Trolley jack.</li> <li>• Combination spanner set.</li> <li>• Brake tester.</li> <li>• Screw driver set.</li> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Vehicle scanner.</li> </ul> <p><b>Consumables</b></p> <ul style="list-style-type: none"> <li>• Brake fluid</li> <li>• Gloves</li> <li>• Cotton rag</li> <li>• ABS Wheel sensors</li> <li>• ABS modulator</li> <li>• W.D-40</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehensive lab</li> <li>• Classroom</li> </ul>
<p><b>LU4:</b> Perform Repair of Anti-Lock Braking</p>	<p><b>The trainee will be able to:</b></p>	<ul style="list-style-type: none"> <li>• Define traction control system (TCS).</li> <li>• Enlist parts of traction control system (TCS).</li> </ul>	<p><b>Total</b> 25 hours</p>	<ul style="list-style-type: none"> <li>• Trolley jack.</li> <li>• Combination spanner set.</li> </ul>	<ul style="list-style-type: none"> <li>• Comprehensive lab</li> </ul>

<p>System (ABS).</p>	<ul style="list-style-type: none"> <li>• Raise vehicle via car jack / lift and place safety support if required.</li> <li>• Clear malfunctioning unit with the help of vehicle scanner.</li> <li>• Disconnect impulse sensor, electrical connector and check sensor for continuity.</li> <li>• Clean hoses connections thoroughly for blockage or crimping.</li> <li>• Replace faulty components of Anti-Lock Braking System (ABS) as per Manufacturer specifications.</li> <li>• After repair, ensure that warning lights on the instrument panel operate properly.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain steering angle control system.</li> </ul> <p><b>Practical Activities</b></p> <ul style="list-style-type: none"> <li>• Clear malfunctioning unit with the help of vehicle scanner.</li> <li>• Check disconnects impulse sensor, Electrical connector and sensor continuity.</li> <li>• Replace faulty components of anti-lock braking system as per manufacture specifications.</li> <li>• After repair ensure that warning lights on the instrument panel operate properly.</li> </ul>	<p><b>Theory:</b> 5 hours</p> <p><b>Practical:</b> 20 hours</p>	<ul style="list-style-type: none"> <li>• Brake tester.</li> <li>• Screw driver set.</li> <li>• Combination plier.</li> <li>• Nose plier.</li> <li>• Socket set.</li> <li>• Vehicle scanner.</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom</li> </ul>
----------------------	---	---	---	--	---

## Module 12: Repair Suspension / Steering System

**Objective of the module:** This module is developed to provide skills and knowledge to repair suspension system and ancillary components of vehicle by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to perform inspection and diagnosis of faults in Suspension System of vehicle and perform road test to verify performance of the vehicle.

**Duration:** 240      **Theory:** 40      **Practical:** 200

Learning Unit	Learning Outcomes	Learning Elements	Duration/CR Hors	Materials Required	Learning Place
<b>LU1:</b> Diagnose Faults in Suspension System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Perform road tests on different types of roads to verify abnormal noise/stability and vibrations</li> <li>Lift-up and perform physical inspection (Shock Absorber Leakage, Bushes, Coil Springs, Leaf Springs, Tension and Torsion Bars, Stabilizer Bars, Spring Seat etc.) to identify abnormal wear/tear and movements</li> <li>Perform ground clearance according to manufacturer specifications</li> </ul>	<ol style="list-style-type: none"> <li>Explain the purpose and function of the following.               <ol style="list-style-type: none"> <li>Independent suspension system</li> <li>non-independent suspension system</li> <li>Semi-independent system.</li> </ol> </li> <li>Explain the function of Wheel bearings and hub (driving and non-driving hub)</li> </ol> <p><b>Practical Activities:</b></p> <ol style="list-style-type: none"> <li>Perform the road test and diagnosing the suspension system noise.</li> <li>Raise the vehicle and inspect following components. Lower control arm bush, Leaking the shock absorber oil, broken spring (coil spring/ leaf spring), stabilizer bar and bush lower ball joints, Z-link, axle bearing (wheel bearing) under the specified procedure</li> <li>Inspect the vehicle ride height/trim height.</li> <li>Carryout Inspection of wheel bearings</li> </ol>	<p><b>Total:</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>Vehicle</li> <li>Tools trolley (Complete set of hand tools)</li> <li>Hydraulic jack /safety stand</li> <li>Car lift</li> <li>Automotive scanner</li> <li>Suspension (SST)Ball joint removal</li> <li>Grease gun</li> <li>Hydraulic press</li> <li>Oil can</li> </ul> <p><b>Consumable Items:</b></p> <ul style="list-style-type: none"> <li>Grease</li> <li>Kerosene Oil</li> <li>Cotton rag</li> <li>Wheel bearings</li> </ul>	<ul style="list-style-type: none"> <li>Class room</li> <li>Workshop</li> </ul>

<p><b>LU2:</b> Repair or Service Suspension System</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Replace Ball Joints, Lower Control Arms, Z-links and Stabiliser Bar to avoid wear and tear of suspension, if required</li> <li>• Replace front and rear Shock Absorbers to verify smooth operation of Shock Absorber as per set standards</li> <li>• Fix or replace front and rear spring, height and tension of springs as per set standards</li> </ul>	<p>faults</p> <ul style="list-style-type: none"> <li>• Describe the Suspension main Components as following Beam axle, live axle, strut/McPherson strut, wishbone, trailing arm/semi trailing arm, torsion beam, springs (Coil, leaf, torsion, air), shock absorber antiroll bars, sub-frame assemblies, shackles, hangers, u bolt, damper bushes.</li> </ul> <p><b>Practical activities</b></p> <ol style="list-style-type: none"> <li>1. Removal and refit of Macpherson struts from the vehicle under the specified procedure in the repair manual.</li> <li>2. Use the spring compressor and replace the coil spring /shock absorber under the specified procedure.</li> <li>3. Change the stabilizer bar, rubber bush and Z-link of the vehicle under the specified procedure.</li> <li>4. Replace the lower control arm ball joints and change the ball joint dust boot.</li> <li>5. Inspect and replace the main component of leaf springs as following. Master leaf, center bolt, bum stopper, shackle, hanger, rubber bushes, rebound clips.</li> <li>6. Replace the wheel bearings and wheel hub under the specified procedure.</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Bearing seals</li> <li>• Vehicle</li> <li>• Tools trolley (Complete set of hand tools)</li> <li>• Hydraulic jack /safety stand</li> <li>• Car lift</li> <li>• Automotive scanner</li> <li>• Suspension (SST)Ball joint removal</li> <li>• Grease gun</li> <li>• Coil spring compressor</li> <li>• Oil can</li> </ul> <p><b>Consumable Items:</b></p> <ul style="list-style-type: none"> <li>• Silicone Grease</li> <li>• Dust cover Boots</li> <li>• Rubber bushes</li> <li>• Kerosene Oil</li> <li>• Cotton rag</li> <li>• Washing gun</li> <li>• Shock absorber</li> <li>• Wheel Hub</li> <li>• Coil spring</li> <li>• Leaves springs</li> </ul>	<ul style="list-style-type: none"> <li>• Class room</li> <li>• Workshop</li> </ul>
--	--	--	---	---	--

				<ul style="list-style-type: none"> <li>• Thread locking tube</li> <li>• ball joints</li> <li>• D- bushes</li> <li>• Z link</li> <li>• Lower control arm</li> <li>• Rubber bushes</li> <li>• Shock mounts</li> <li>• Wheel nut and studs</li> <li>• Shock glass</li> </ul>	
<b>LU3:</b> Diagnose Steering System	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Perform road tests on different types of roads to verify abnormal noise/stability and vibrations</li> <li>• Check steering rack assembly to identify fault, if any</li> <li>• Check power steering pump, pipe, connection, belt, steering rack and fluid level of hydraulic power steering gear box including leakage, if any.</li> <li>• Check wiring, steering assembly,</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the function and purpose of the steering system as following. Tie rod, tie rod rubber boots, rack ends ball joints, adjuster assembly, pinion gear, rack gear, steering lubricants, steering column, spiral cable, intermediate shaft, steering ratio, steering control arm, knuckle, and universal joints</li> <li>• Describe the EPS system.</li> </ul> <p><b>Practical activities</b></p> <ol style="list-style-type: none"> <li>1. Perform the road test and diagnosing the steering system fault.</li> <li>2. Removal and refit of steering box rack and pinion from the vehicle under the specified procedure.</li> <li>3. Inspect the tie rods end/rack end set under the specified procedure.</li> <li>4. Inspect the power assisted steering for abnormal noise play and leakage.</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Vehicle equipped with the power steering and manual steering</li> <li>• Tools trolley (Complete set of hand tools)</li> <li>• Hydraulic jack /safety stand</li> <li>• Car lift (two post lift)</li> <li>• Automotive scanner</li> <li>• Ball joint (Rack end) remover</li> <li>• Grease gun</li> <li>• Steering fluid pressure tester</li> </ul>	<ul style="list-style-type: none"> <li>• Class room</li> <li>• Workshop</li> </ul>

	<p>EPS module and electrical connection of Electronic Power Steering (EPS).</p> <ul style="list-style-type: none"> <li>• Check EPS sensor light in instrument panel</li> <li>• Check all mounting nuts and bolts to ensure safety</li> </ul>	<ol style="list-style-type: none"> <li>5. Check EPS warning light</li> <li>6. Diagnose the EPS faults (DTC) by using scanner</li> </ol>		<ul style="list-style-type: none"> <li>• Torque wrench</li> <li>• Measuring tape</li> </ul> <p><b>Consumable items</b></p> <ul style="list-style-type: none"> <li>• Oil can</li> <li>• Cotton rag</li> <li>• Power steering fluid</li> <li>• Steering dust boots</li> <li>• spiral cable</li> </ul>	
<p><b>LU4:</b> Repair of Steering System</p>	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>• Repair/ replace faulty components of steering system according to set standards</li> <li>• Replace/ repair electrical components of EPS, if required</li> <li>• Perform steering calibration, if required</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the function and purpose of power assisted steering system as following. Power steering pump, steering control valve, hoses, Power steering oil.</li> </ul> <p><b>Practical Activities</b></p> <ol style="list-style-type: none"> <li>1. Change the rubber boots of steering rack ends.</li> <li>2. Steering box service and adjust the backlash under the specified procedures.</li> <li>3. Service of steering box under the specified procedure.</li> <li>4. Inspect the tie rods end/rack end set under the specified procedure.</li> <li>5. Replace the power steering pump</li> <li>6. Repair/replace the power assisted steering for abnormal noise and play.</li> <li>7. Change the power steering fluid</li> <li>8. Adjust steering play</li> <li>9. Replace the EPS motor</li> </ol>	<p><b>Total</b> 60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>• Vehicle equipped with the power steering and manual steering</li> <li>• Tools trolley (Complete set of hand tools)</li> <li>• Hydraulic jack /safety stand</li> <li>• Car lift (two post lift)</li> <li>• Automotive scanner</li> <li>• Ball joint (Rack end) remover</li> <li>• Grease gun</li> <li>• Steering fluid pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Class room</li> <li>• Workshop</li> </ul>

				tester • Oil can <b>Consumables</b> • Tie rod • Silicon grease	
--	--	--	--	--	--

## Module 13: Carry out Wheel Balancing and Alignment

**Objective of the module:** This module is designed to provide skills and knowledge related to wheel balancing and steering alignment of vehicle by Auto Mechanic, in accordance with the Manufacturer Manual. You will be able to perform wheel and steering alignment and balance and repair faulty part/s according to set standards.

**Duration:** 120      **Theory:** 20      **Practical:** 100

Learning Unit	Learning Outcomes	Learning Elements	Duration/CR Hors	Materials Required	Learning Place
LU1: Perform Wheel Balancing	<p><b>The trainee will be able to:</b></p> <ul style="list-style-type: none"> <li>Perform road test to verify the balance of wheels according to set standards</li> <li>Check Wheel rim and tyre condition according to set standards</li> <li>Carry out wheel balancing using appropriate wheel balancing equipment and fix weight/s as per requirement</li> <li>Re-test vehicle on road to verify correction of wheels balancing according to set standards</li> </ul>	<ul style="list-style-type: none"> <li>Define wheel.</li> <li>Write the types of rim.</li> <li>Explain the following               <ol style="list-style-type: none"> <li>Rim design.</li> <li>Drop center wheel.</li> <li>Semi drop center wheel.</li> <li>Safety wheel.</li> <li>Split wheel</li> </ol> </li> <li>Define the function of tires.</li> <li>Explain the types of tire according to construction.</li> <li>Define following tire specification               <ol style="list-style-type: none"> <li>Tire width.</li> <li>Aspect ratio.</li> <li>Construction of tire</li> <li>Rim size.</li> <li>Load index.</li> <li>Speed symbol.</li> </ol> </li> <li>State Tire rotation.</li> </ul> <p><b>Practical activities</b></p> <ol style="list-style-type: none"> <li>Perform wheel balancing of wheels on wheel balancing machine, attach the weights as per requirement</li> </ol>	<p><b>Total:</b> 60</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<ul style="list-style-type: none"> <li>Vehicle</li> <li>Tools trolley (Complete set of hand tools)</li> <li>Hydraulic jack /safety stand</li> <li>Wheel balancing machine.</li> <li>Wheel balancing weight plier</li> </ul> <p><b>Consumable Items:</b></p> <ul style="list-style-type: none"> <li>Weights (different sizes)</li> <li>Cotton rag</li> </ul>	<ul style="list-style-type: none"> <li>Class room</li> <li>Wheel balancing workshop.</li> </ul>
LU1: Perform	<b>The trainee will be able</b>	<ul style="list-style-type: none"> <li>Describe the wheel balancing machine</li> </ul>	<b>Total</b>	<ul style="list-style-type: none"> <li>Vehicle</li> <li>Tools trolley</li> </ul>	<ul style="list-style-type: none"> <li>Class room</li> <li>Wheel alignment</li> </ul>



Wheel Alignment	<p><b>to:</b></p> <ul style="list-style-type: none"> <li>• Perform road test to verify alignment of wheels according to set standards</li> <li>• Check functionality of suspension, steering and adjust camber, caster, toe-in-and toe-out according to set standards</li> <li>• Re-test vehicle on road to verify alignment of wheels according to set standards</li> </ul>	<p>features as following.</p> <ul style="list-style-type: none"> <li>• Setting procedure, Digital data setting procedure, cycle time, weight installation and removal procedure, machine calibration.</li> </ul> <p><b>Practical activities</b></p> <ul style="list-style-type: none"> <li>• Describe the following functions/principles of wheel alignment. Ackerman principle for a true rolling motion, steering pull, steering center point.</li> <li>• Describe the wheel alignment faults as following. Toe in, toe out, positive camber, negative camber, positive caster, steering axes inclination, included angle, tire wear, ride height, trim height of vehicle</li> </ul> <p><b>Practical Activities:</b></p> <ol style="list-style-type: none"> <li>2. Perform vehicle pre alignment checks as following.</li> <li>3. Tire pressure, tire deformation, tie rod ends, suspension fault, chasses damage.</li> <li>4. Perform wheel alignment on machine and adjust toe, camber, and caster.</li> </ol>	<p>60 Hours</p> <p><b>Theory:</b> 10 Hours</p> <p><b>Practical:</b> 50 Hours</p>	<p>(Complete set of hand tools)</p> <ul style="list-style-type: none"> <li>• Hydraulic jack /safety stand</li> <li>• wheel alignment machine</li> <li>• Air compressor</li> <li>• Tire pressure gauge</li> <li>• Steering wheel puller</li> <li>• Alignment scissors lift</li> <li>• Turn table</li> <li>• Steering lock holder</li> <li>• Wheel stopper</li> </ul> <p><b>Consumable Items:</b></p> <ul style="list-style-type: none"> <li>• Camber bolts</li> <li>• Cotton rag</li> </ul>	workshop.
-----------------	--	--	--	--	-----------

## Assessment Guidance for Auto Mechanic

Competency-based assessment is the process of gathering evidence to confirm the candidate's ability to perform according to specified outcomes articulated in the competency standard(s).

### Types of assessment

#### a) Sessional assessment

The goal of sessional assessment is to monitor student progress in order to provide constant feedback. This feedback can be used by the trainers to improve their teaching and by learners to improve their learning.

More specifically, sessional assessments help learners to identify their strengths and weaknesses and help trainers to recognize where learners are struggling and address problems immediately.

Examples of sessional assessments include:

- Observations
- Presentations
- Activity sheets
- Project work
- Oral questions

#### b) Summative (final) assessment

The goal of summative (final) assessment is to evaluate learning progress at the end of a training programme by comparing it against, e.g. set of competency standards.

Examples of summative assessments include:

- Direct observation of work activities
- Final project
- Written questions

### Principles of assessment

When conducting assessment or developing assessment tools, trainers/assessors need to ensure that the following principles of assessment are met:

#### Validity

- Indicates if the assessment outcome is supported by evidence. The assessment outcome is valid if the assessment methods and materials reflect the critical aspects of evidence required by the competency standards (Competency units, performance criteria, knowledge and understanding).

#### Reliability

- Indicates the level of consistency and accuracy of the assessment outcomes. The assessment is reliable if the assessment outcome will produce the same result for learners with equal competence at different times or places, regardless of the trainer or assessor conducting the assessment.

**Flexibility**

- Indicates the opportunity for learners to discuss certain aspects of their assessment with their trainer or assessor, such as scheduling the assessment. All learners should be made aware of the purpose of assessment, the assessment criteria, the methods and tools used, and the context and proposed timing of the assessment well in advance. This can be achieved by drawing up a plan for assessment.

**Fair assessment**

- Fair assessment does not advantage or disadvantage particular learners because of status, race, beliefs, culture and/ or gender. This also means that assessment methods may need to be adjusted for learners with disabilities or cultural differences. An assessment should not place unnecessary demands on learners that may prevent them from demonstrating competence.

## Assessment strategy for Auto Mechanic

### Assessment template – Sessional and Summative assessment

Learning Units	Tentative Assessment Hours	Recommended form of assessment	
		Sessional	Summative
Demonstrate Communication Skills		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	Integrated assessment: <ul style="list-style-type: none"> <li>• Project</li> <li>• Demonstration</li> <li>• Role play</li> <li>• Oral and written questions</li> </ul>
Maintain Safe Work Environment		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Ignition System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Fuel System (Carburetor)		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Perform Service of Electronic Fuel Injection Systems		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Engine Cooling System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Engine Lubrication System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Perform Overhauling of Engine		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> </ul>	

Learning Units	Tentative Assessment Hours	Recommended form of assessment	
		Sessional	Summative
		<ul style="list-style-type: none"> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Manual Transmission System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Automatic Transmission System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Braking Systems		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Repair Suspension / Steering System		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	
Carry out Wheel Balancing and Alignment		<ul style="list-style-type: none"> <li>• Observation</li> <li>• Activity sheets</li> <li>• Simulation</li> <li>• Oral and written questions</li> <li>• Demonstration</li> </ul>	

## Complete list of tools and equipment

Sr#	Description	Quantity
1.	Air Bleeding Jar	
2.	Air Blow Gun	
3.	Air Compressor (Double Stage)	
4.	Alignment Scissors Lift	
5.	Automotive Scanner	
6.	Ball Joint (Rack End) Remover	
7.	Battery Charger	
8.	Bearing Puller	
9.	Brake Fluid Tester.	
10.	Brake Tester.	
11.	Car Lift (Two Post Lift)	
12.	Car lift/ Hydraulic Jack.	
13.	Coil Spring Compressor	
14.	Combination Plier.	
15.	Combination Scanner	
16.	Combination Spanner Set.	
17.	Complete Tool Kit	
18.	Compression Gauge.	
19.	Computers	
20.	Creeper	
21.	Dial Gauge	
22.	Diesel Fuel Injection Pump (Inline, Rotary)	
23.	Diesel Injector Tester	
24.	Diesel Pump Test Bench	
25.	Engine Hoist	
26.	Engine Scanner.	
27.	Engine Stand.	
28.	Exhaust Gas Analyzer	
29.	Feeler Gauge.	

<b>Sr#</b>	<b>Description</b>	<b>Quantity</b>
30.	Firefighting Equipment	
31.	Fuel Pressure Gauge	
32.	Gear Puller	
33.	Grease Gun	
34.	Hammer Different Size	
35.	Hydraulic Jack with Different Capacities	
36.	Hydraulic press	
37.	Hydrometer	
38.	Injector Cleaner	
39.	<b>Internet Connection</b>	
40.	Jack Trolley.	
41.	Lift Two Post Lift	
42.	Measuring tape	
43.	<b>Multimedia</b>	
44.	Multi-meter	
45.	Nose Plier.	
46.	Oil Can	
47.	Oil Pressure Tester	
48.	Open End Spanner	
49.	Piston Ring Compressor Tool.	
50.	PPEs	
51.	Radiator Pressure Tester	
52.	Repair Manual	
53.	Ring Spanner Set	
54.	Safety Charts	
55.	Safety Stand with Different Sizes	
56.	Scale (Size 06", 12", 18")	
57.	Scanner	
58.	Screw Driver Flat (Set)	
59.	Screw Driver Philip (Set).	
60.	Seal Extractor	
61.	Sealant Gun	
62.	Service Manual	

<b>Sr#</b>	<b>Description</b>	<b>Quantity</b>
63.	Smart LED TV for Classroom	
64.	Snap Ring Pliers	
65.	Socket Set.	
66.	Spark Plug Cleaner and Tester.	
67.	Special Service Tools (SST)	
68.	Steering Fluid Pressure Tester	
69.	Steering Lock Holder	
70.	Steering Wheel Puller	
71.	Stethoscope	
72.	Suspension (SST) Ball Joint Removal	
73.	Tachometer	
74.	Test Lamp.	
75.	Timing Light Gun	
76.	Tire Pressure Gauge	
77.	Tool Kit (Hand Tools).	
78.	Tools Trolley (Complete Set of Hand Tools)	
79.	Torque Wrench	
80.	Turn Table	
81.	Universal Strap Wrench/ Oil Filter Spanner	
82.	Vacuum Gauge	
83.	Valve Spring Compressor Tool.	
84.	Vehicle equipped with the ABS, power steering and workshop manual	
85.	Vernier Caliper.	
86.	Washing Tray	
87.	Wheel Alignment Machine	
88.	Wheel Balancing Machine.	
89.	Wheel Balancing Weight Plier	
90.	Wheel Spanner.	
91.	Wheel Stopper	
92.	Wire Brush	
93.	Working Bench	



## List of Consumable Supplies

Sr#	Description	Quantity
1.	ABS modulator	
2.	ABS Wheel sensors	
3.	Air Filter.	
4.	Alternator and AC Belts.	
5.	Auto Wire	
6.	Axle Seal Set.	
7.	Ball Joints	
8.	Bearing Seals	
9.	Bolts Kit	
10.	Brake Drum	
11.	Brake Fluid	
12.	Brake Shoes	
13.	C,B. Point	
14.	Camber Bolts	
15.	Carburetor Cleaner	
16.	Carburetor Kit	
17.	CKP Sensor	
18.	Clutch Bearings	
19.	Clutch Cables	
20.	Clutch Cylinders	
21.	Clutch Disc	
22.	Clutch Fluids	
23.	Clutch Set.	
24.	CMP Sensor.	
25.	Coil Spring	
26.	Condenser	
27.	Cotton Gloves	
28.	Cotton Rag.	
29.	Cotton Waste	
30.	Cotton waste	
31.	Dust Bushes	
32.	Diesel fuel	
33.	Disc Pad	
34.	Disc Plate	
35.	Distilled Water	
36.	Distributor Cap	
37.	Dust cover Boots	
38.	Dust Cover of Drive Shaft	
39.	ECM	
40.	ECT Sensor, TP Sensor	
41.	Engine Coolant.	
42.	Engine Oil	
43.	Fan Belt	
44.	Flywheel Bearing.	
45.	Fuel Injectors	
46.	Fuse	
47.	Gear Oil.	
48.	Gloves	
49.	Grease	
50.	High Tension Lead	

<b>Sr#</b>	<b>Description</b>	<b>Quantity</b>
51.	Hoses Clamp	
52.	House Pipe.	
53.	IAT Sensor	
54.	Idle Air Control Valve	
55.	Insulation Tap	
56.	Kerosene Oil	
57.	Knock Sensor	
58.	Leaves Springs	
59.	Lower Control Arm	
60.	MAP Sensor	
61.	Master Cylinder Kit	
62.	Mounts	
63.	Oil Can	
64.	Oil Filter	
65.	Oil Pump	
66.	Overhauling kit	
67.	Petrol	
68.	Piston Ring Set	
69.	Piston Set	
70.	Power Steering Fluid	
71.	PPEs	
72.	Pressure Plate	
73.	Radiator Assembly	
74.	Radiator Cap	
75.	Radiator Coolant	
76.	Radiator Fan Motors	
77.	Radiator Fan Shroud	
78.	Rotor	
79.	Round Brush	
80.	Rubber Bushes	
81.	Sand Paper	
82.	Sealants	
83.	Seals	
84.	Shock Absorber	
85.	Shock Mounts	
86.	Silicone Grease	
87.	Silicone Tube	
88.	Solenoid Valve Rings	
89.	Solenoid Valves	
90.	Spark Plug	
91.	Spools Valves	
92.	Steering Dust Boots	
93.	Thermostat Valve	
94.	Thread Locking Tube	
95.	Thrust Washers Set	
96.	Tie Rod	
97.	Timing Belt and Bearing.	
98.	Transmission Filter	
99.	Transmission Fluid	
100.	Transmission Oil SAE 75W85	
101.	Transmission Oil SAE 75W85	
102.	Universal Joint Cross	

<b>Sr#</b>	<b>Description</b>	<b>Quantity</b>
103.	Valve Guide Set	
104.	Valve Seal Set	
105.	Valve Set	
106.	W.D-40	
107.	Washing Gun	
108.	Washing Tray	
109.	Water Hoses	
110.	Water Pump	
111.	Water Pump Gas Kit	
112.	Water Temperature Gauge	
113.	Water Temperature Sensor	
114.	Weights (Different Sizes)	
115.	Wheel Bearings	
116.	Wheel Cylinder Kit	
117.	Wheel Nut and Studs	
118.	Wire Grips (Connectors)	
119.	Z Link	

## Credit values

The credit value of the National Certificate in Auto Mechanic Level 2-4 is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines).


The credit values are as follows:

Competency Standard	Estimate of hours	Credit
A. Demonstrate Communication Skills	30	03
B. Maintain Safe Work Environment	30	03
C. Repair Ignition System	100	10
D. Repair Fuel System (Carburetor)	100	10
E. Perform Service of Electronic Fuel Injection Systems	180	18
F. Repair Engine Cooling System	100	10
G. Repair Engine Lubrication System	120	12
H. Perform Overhauling of Engine	240	24
I. Repair Manual Transmission System	180	18
J. Repair Automatic Transmission System	240	24
K. Repair Braking Systems	100	10
L. Repair Suspension / Steering System	240	24
M. Carry out Wheel Balancing and Alignment	120	12

## National Vocational and Technical Training Commission (NAVTTTC)

 Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan

 +92 51 9044 322

 +92 51 9044 322

 [info@navttc.org](mailto:info@navttc.org)

 [www.navttc.org](http://www.navttc.org)