

# AUTOMOTIVE MECHANICS

## LEVEL – II



# CURRICULUM

**Based on December, 2021 Version 3 Occupational  
Standard (OS)**

March, 2022  
Addis Ababa, Ethiopia

## Preface

The reformed TVET-System is an outcome-based system. It utilizes the needs of the labour market and occupational requirements from the world of work as the benchmark and standard for TVET delivery. The requirements from the world of work are analysed and documented – taking into account international benchmarking – as Occupational Standards (OS).

In the reformed TVET-System, curricula and curriculum development play an important role with regard to quality driven comparable TVET-Delivery. The Curricula help to facilitate the training process in a way, that trainees acquire the set of occupational competences (skills, knowledge and attitude) required at the working place and defined in the Occupational Standards (OS).

This curriculum has been developed by a group of professional experts from different Regional TVET Bureaus, colleges, Industries, Institutes and universities based on the occupational standard for Automotive Mechanics Level II.

The curriculum development process has been actively supported and facilitated by **Ministry of Labour and Skills**.

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## TVET-Program Design

### 1.1. TVET-Program Title: Automotive Mechanics Level II

### 1.2. TVET-Program Description

The Program is designed to develop the necessary knowledge, skills and attitude of the trainees to the standard required by the occupation. The contents of this program are in line with the occupational standard. The Trainees who successfully completed the Program will be qualified to work as an Automotive Mechanic Level-II with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the Economic infra-structure in the field of Automotive Technology.

The prime objective of this training program is to equip the Trainees with the identified competences specified in the OS. Graduates are therefore expected to Service Engine and associated System Assemblies, Service two and three-wheeler vehicle Assemblies, Perform minor Engine Electrical Systems Service, Read and interpret Machine drawing, Service power train system, Perform minor under Chassis Systems service, Carry out Wheel Alignment, Prevent and Eliminate MUDA in accordance with the performance criteria and evidence guide described in the OS.

### 1.3. TVET-Program Training Outcomes

The expected outputs of this program are the acquisition and implementation of the following units of competences:

[EIS AUM2 01 1221](#) Service Engine and associated System Assemblies

[EIS AUM2 02 1221](#) Service two and three-wheeler vehicle Assemblies

[EIS AUM2 03 1221](#) Perform minor Engine Electrical Systems Service

[EIS AUM2 04 1221](#) Read and interpret Machine drawing

[EIS AUM2 05 1221](#) Service power train system

[EIS AUM2 06 1221](#) Perform minor under Chassis Systems service

[EIS AUM2 07 1221](#) Carry out Wheel Alignment

[EIS AUM2 08 1221](#) Prevent and Eliminate MUDA

### 1.4. Duration of the TVET-Program

The Program will have duration of 480 hours including the on school/ Institution training and on-the-job practice or cooperative training time. Such cooperative training based on realities of the industry, nature of the occupation, location of the TVET institution, and other factors will be considered in the training delivery to ensure that trainees acquire practical and workplace experience.

s.no	Unit competency	TVET Institution training		Cooperative training	Total hours	Remarks
		Theory	Practical			
1.	Prevent and Eliminate MUDA	10	20	10	40	
2.	Read and interpret Machine drawing	10	20	10	50	
3.	Service Engine and associated System Assemblies	20	30	20	70	
4.	Perform minor Engine Electrical Systems Service	20	30	20	70	
5.	Service power train system	15	30	25	70	
6.	Perform minor under Chassis Systems service	10	30	20	60	
7.	Carry out Wheel Alignment	10	20	10	40	
8.	Service two and three-wheeler vehicle Assemblies	20	40	20	80	
<b>TOTAL HOURS</b>		115	220	135	480	

### 1.5. Qualification Level and Certification

Based on the descriptors elaborated on the Ethiopian National TVET Qualification Framework (NTQF) the qualification of this specific TVET Program is Automotive Mechanics Level II.

The trainee can exit after successfully completing the modules in one level and will be awarded the equivalent institutional certificate on the level completed. However, only institutional certificate of training accomplishment will be awarded.

### 1.6. Target Groups

Any citizen with or without disability who meets the entry requirements under items 1.7 and capable of participating in the training activities is entitled to take part in the Program.

### 1.7 Entry Requirements

The prospective participants of this program are required to possess the requirements or directive of the **Ministry of Labour and Skills**.

### 1.8 Mode of Delivery

This TVET-Program is characterized as a formal Program on middle level technical skills. The mode of delivery is co-operative training. The time spent by the trainees in the real work place/ industry will give them enough exposure to the actual world of work and enable them to get hands-on experience.

The co-operative approach will be supported with school-based lecture-discussion, simulation and actual practice. These modalities will be utilized before the trainees are exposed to the industry environment.

Hence based on the nature of the occupation, location of the TVET institutions, and interest of the industry alternative mode of cooperative training such as apprenticeships, internship and traineeship will be employed. In addition, in the areas where industry is not sufficiently available the established production and service centres/learning factories in TVET institutions will be used as cooperative training places. The Training-Institution and identified companies should have an agreement to co-operate with regard to the implementation of this program.

### 1.9. TVET-Program Structure

Unit of Competence		Module Code & Title		Training Outcomes	Duration (In Hours)
<a href="#">EIS AUM2 08 1221</a>	Prevent and Eliminate MUDA	<a href="#">EIS AUM2 M01 0322</a>	Preventing and Eliminating MUDA	<ul style="list-style-type: none"> <li>• Prepare for work</li> <li>• Identify MUDA and problem</li> <li>• Analyse causes of a problem.</li> <li>• Eliminate MUDA and Assess effectiveness of the solution.</li> <li>• Prevent occurrence of wastes and sustain operation.</li> </ul>	40
<a href="#">EIS AUM2 04 1221</a>	Read and Interpret Machine drawing	<a href="#">EIS AUM2 M02 0322</a>	Reading and Interpreting Machine drawing	<ul style="list-style-type: none"> <li>• Identify machine drawing</li> <li>• Identify views, standard symbols and lines</li> <li>• Interpret machine drawing Test</li> </ul>	50
<a href="#">EIS AUM2 01 1221</a>	Service Engine and associated System Assemblies	<a href="#">EIS AUM2 M03 0322</a>	Servicing Engine and associated System Assemblies	<ul style="list-style-type: none"> <li>• Prepare for work</li> <li>• Remove and disassemble system assembly</li> <li>• Replace and/or reassemble system assembly</li> <li>• Clean up work area and maintain tools and equipment</li> </ul>	70

<a href="#">EIS AUM2 03 1221</a>	Perform minor Engine Electrical Systems Service	<a href="#">EIS AUM2 M04 0322</a>	Performing minor Engine Electrical Systems Service	<ul style="list-style-type: none"> <li>• Prepare to test engine electrical systems</li> <li>• Test engine electrical system</li> <li>• Perform minor engine electrical system service</li> <li>• Clean up work area and maintain equipment</li> </ul>	70
<a href="#">EIS AUM2 05 1221</a>	Service Power train System	<a href="#">EIS AUM2 M05 0322</a>	Servicing Power train System	<ul style="list-style-type: none"> <li>• Prepare to remove power train drive line assemblies</li> <li>• Remove and inspect power train drive line assemblies</li> <li>• Service power train drive line assemblies</li> <li>• Clean up work area and finalise work processes</li> </ul>	70
<a href="#">EIS AUM2 06 1221</a>	Perform minor Under Chassis Systems Service	<a href="#">EIS AUM2 M06 0322</a>	Performing minor Under Chassis Systems Service	<ul style="list-style-type: none"> <li>• Prepare to undertake minor service to under chassis systems</li> <li>• Conduct basic inspection/test</li> <li>• Carry out minor repair</li> <li>• Clean up work area and maintain the equipment</li> </ul>	60

<a href="#">EIS AUM2 07 1221</a>	Carry out Wheel Alignment	<a href="#">EIS AUM2 M07 03 0322</a>	Carrying out Wheel Alignment	<ul style="list-style-type: none"> <li>• Carry out wheel alignment pre-checks</li> <li>• Perform wheel alignment</li> <li>• Clean up work area and maintain equipment</li> </ul>	40
<a href="#">EIS AUM2 02 1221</a>	Service Two and Three-wheeler vehicle Assemblies	<a href="#">EIS AUM2 M08 0322</a>	Servicing Two and Three-wheeler vehicle Assemblies	<ul style="list-style-type: none"> <li>• Prepare for work</li> <li>• Remove and disassembled system assemblies</li> <li>• Clean up work area and maintain equipment</li> </ul>	80

\*The time duration (Hours) indicated for the module should include all activities in and out of the TVET institution.

### 1.10 Institutional Assessment

Two types of evaluation will be used in determining the extent to which training outcomes are achieved. The specific training outcomes are stated in the modules. In assessing them, verifiable and observable indicators and standards shall be used.

The *formative assessment* is incorporated in the training modules and form part of the training process. Formative evaluation provides the trainee with feedback regarding success or failure in attaining training outcomes. It identifies the specific training errors that need to be corrected, and provides reinforcement for successful performance as well. For the teacher, formative evaluation provides information for making instruction and remedial work more effective.

*Summative Evaluation* is the other form of evaluation is given when all the modules in the program have been accomplished. It determines the extent to which competence have been achieved. And, the result of this assessment decision shall be expressed in the term of institutional Assessment implementation guidelines..

Techniques or tools for obtaining information about trainees' achievement include oral or written test, demonstration and on-site observation.

### 1.11 TVET Trainers Profile

The trainers conducting this particular TVET Program are B Level and above who have satisfactory practical experiences or equivalent qualifications.

<b>LEARNING MODULE 01</b>
<b>TVET-PROGRAMME TITLE:</b> Automotive Mechanics Level II
<b>MODULE TITLE :</b> Preventing and Eliminating MUDA
<b>MODULE CODE :</b> EIS AUM2 M01 0322
<b>NOMINAL DURATION :</b> 40hours
<b>MODULE DESCRIPTION :</b> This module covers the knowledge, skills and attitude required by a worker to prevent and eliminate MUDA/wastes in his/her workplace by applying scientific problem-solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis.
<p><b>LEARNING OUTCOMES</b></p> <p>At the end of the module the trainee will be able to:</p> <p><b>LO1.</b> Prepare for work</p> <p><b>LO2.</b> Identify MUDA and problem</p> <p><b>LO3.</b> Analyse causes of a problem</p> <p><b>LO4.</b> Eliminate MUDA and Assess effectiveness of the solution</p>
<p><b>MODULE CONTENTS:</b></p> <p><b>LO1. Prepare for work</b></p> <p>1.1.Determining job requirement work instructions</p> <p>1.2.OHS requirements for personal protection</p> <p>1.3.Selecting appropriate materials for work</p> <p>1.4.Identifying and check Safety equipment and tools</p> <p><b>LO2. Identify MUDA and problem</b></p> <p>2.1 Identifying problem and prepare Plan for MUDA</p> <p>2.2 Discussing causes and effects of MUDA</p> <p>2.3 Using statistical tools and techniques list Kaizen problems</p> <p>2.4 Analysing list and post on Kaizen Board</p> <p>2.5 Identifying and measure relevant procedures on MUDA</p> <p><b>LO3. Analyse causes of a problem</b></p> <p>3.1.Listing all possible cause of problem</p> <p>3.2.Analysing cause using 4M1E</p> <p>3.3.Using creative idea generation eliminate critical root cause</p> <p>3.4.Preparing action plan suggest solution</p>

**LO4. Eliminate MUDA and Assess effectiveness of the solution**

- 4.2. Implementing Plan of MUDA
- 4.3. Adopting ten basic principles of eliminate waste/MUDA
- 4.4. Using Tools based on OHS procedures
- 4.5. Identifying Tangible and intangible results
- 4.6. Compare various types of diagrams using tangible results
- 4.7. Reporting gain improvements elimination of waste/MUDA

**LO5. Prevent occurrence of wastes and sustain operation**

- 5.1 Preparing prevention and implementation Plan of MUDA
- 5.2 Preparing machines operation procedure
- 5.3 Preventing wastes/MUDA visual and auditory control methods
- 5.4 Creating waste-free workplace using 5W and 1H sheet
- 5.5 Updating practices Standard Operating Procedures (SOPs)

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

## **ASSESSMENT CRITERIA:**

### **LO.1 Prepare for work**

- Work instructions are used to determine job requirements, including method, material and equipment.
- Job specifications are read and interpreted following working manual.
- OHS requirements, including dust and fume collection, breathing apparatus and eye and ear personal protection needs are observed throughout the work.
- Appropriate material is selected for work.
- Safety equipment and tools are identified and checked for safe and effective operation.

### **LO.2 Identify MUDA and problem**

- Plan of MUDA and problem identification is prepared and implemented.
- Causes and effects of MUDA are discussed.
- All possible problems related to the process /Kaizen elements are listed using statistical tools and techniques.
- All possible problems related to kaizen elements are identified
- are used to draw and analyse current and listed on Visual Management Board/Kaizen Board.
- Tools and techniques situation of the work place.
- Wastes/MUDA are identified and measured based on relevant procedures.
- Identified and measured wastes are reported to relevant personnel.

### **LO.3 Analyze causes of a problem.**

- All possible causes of a problem are listed.
- Cause relationships are analysed using 4M1E.
- Causes of the problems are identified.
- The root cause which is most directly related to the problem is selected.
- All possible ways are listed using creative idea generation to eliminate the most

critical root cause.

- The suggested solutions are carefully tested and evaluated for potential complications.
- Detailed summaries of the action plan are prepared to implement the suggested solution.

**LO.4 Eliminate MUDA and Assess effectiveness of the solution.**

- Plan of MUDA elimination is prepared and implemented by medium KPT members.
- Necessary attitude and the ten basic principles for improvement are adopted to eliminate waste/MUDA.
- Tools and techniques are used to eliminate wastes/MUDA based on the procedures and OHS.
- Wastes/MUDA are reduced and eliminated in accordance with OHS and organizational requirements.
- Tangible and intangible results are identified.
- Tangible results are compared with targets using various types of diagrams.
- Improvements gained by elimination of waste/MUDA are reported to relevant bodies.

**LO.5 Prevent occurrence of wastes and sustain operation.**

- Plan of MUDA prevention is prepared and implemented.
- Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement are discussed and prepared.
- Occurrences of wastes/MUDA are prevented by using visual and auditory control methods.
- Waste-free workplace is created using 5W and 1Hsheet.
- The completion of required operation is done in accordance with standard procedures and practices.
- The updating of standard procedures and practices is facilitated.

The capability of the work team that aligns with the requirements of the procedure is ensured and trained on the new Standard Operating Procedures (SOPs).

## Annex: Resource Requirements

MODULE TITLE: Prevent and Eliminate MUDA				
Module code: - EIS AUM2 M01 0322				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
<b>A. Learning Materials</b>				
1.	TTLM	Prepared by Ministry of Labour and Skill	25Pcs	1:1
2.	Reference Books			
2.1	The spirit of kaizen & One Small Step Can Change Your Life	Robert Maurer	5 Pcs	1:5
2.2	Creating a Kaizen Culture	John Miller	5 Pcs	1:5
2.3	The key to Japan's competitive success	Masaaki Imai	5 Pcs	1:5
3.	Kaizen for Quick Changeover	Keisuke Arai, Kenichi Sekine	5 Pcs	1:5
<b>B. Learning Facilities &amp; Infrastructure</b>				
1.	Class room	31.5 m <sup>2</sup>	1Pcs	1:25
2.	Whit board/Blackboard	240 cm × 120 cm	1Pcs	1:25
3.	Arm Chair	55cm × 100 cm × 70 cm	25Pcs	1:1
4.	Workshop	(4 × 25) m <sup>2</sup>	1Pcs	1:25
5.	LCD	Standard	1Pcs	1:25
6.	Laptop or Computer	32-bit OS; 3 GB RAM; Intel core i5 (Processor)	1Pcs	1:25
7.	Library	Per section 105 – 180 m <sup>2</sup>	1Pcs	1:25
8.	Printer	Laser type	1 Pcs	1:25
9.	Photocopier	Non-coloured	1Pcs	1:25
<b>C. Consumable Materials</b>				
1.	Cleaning rag	cotton	1 meter	1:5
2.	Broom	1.5,4	1Roll	1:25
3.	Dust pan	standard	1Pcs	1:5
4.	Pipe	Blade type, glass	1Pcs	1:25
5.	Detergent	3-5 pin type	1	1:25
6.	Paint	Male & female	1set	1:25
7.	Photocopier ink/toner	Compatible with the existing printer	1Pcs	1:25
8.	Paper	A4 80gms	5 reams	1:25

<b>LEARNING MODULE 02</b>	
<b>TVET-PROGRAMME TITLE:</b> Automotive Mechanics Level II	
<b>MODULE TITLE :</b> Reading and Interpreting Machine Drawing	
<b>MODULE CODE :</b> EIS AUM2 M02 0322	
<b>NOMINAL DURATION :</b> 50hours	
<b>MODULE DESCRIPTION :</b> This Module covers the knowledge, skills and attitude required to read and interpret exploded and sectioned views of automotive component parts. It requires interpretations of standard machine drawings by using symbols, dimensional tolerances and conventional representation of materials, machine elements, and sizes of drawing sheets.	
<p><b>LEARNING OUTCOMES</b></p> <p>At the end of the module the trainee will be able to:</p> <p><b>LO1.</b> Identify Machine Drawing</p> <p><b>LO2.</b> Identify Views Standard Symbols and Lines</p> <p><b>LO3.</b> Interpret Machine Drawing</p>	
<p><b>MODULE CONTENTS:</b></p> <p><b>LO1. Identify Machine Drawing</b></p> <ul style="list-style-type: none"> <li>1.1 Overview of machine drawing</li> <li>1.2 Types of section views</li> <li>1.3 Assembly and Exploded drawing</li> <li>1.4 Following and confirming instructions</li> </ul> <p><b>LO2. Identify Views, Standard Symbols and Lines</b></p> <ul style="list-style-type: none"> <li>2.1 Standards of Machine parts</li> <li>2.2 Scaling and size of drawing sheets</li> <li>2.3 Alphabet of lines</li> <li>2.4 Part drawing of a machine component</li> <li>2.5 Exploded view of a machine drawing</li> <li>2.6 Identifying drawing conventions codes and symbols</li> </ul> <p><b>LO3. Interpret machine drawing</b></p> <ul style="list-style-type: none"> <li>3.1 Interpreting machine drawing component/ assembly</li> <li>3.2 Interpreting drawing symbols and codes</li> <li>3.3 Interpreting drawing dimensions and materials</li> </ul>	

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
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<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO.1 Identify machine drawing**

- Drawing is checked and validated against job requirements
- Drawing version is checked and validated
- Instructions are confirmed and followed as required

**LO.2 Identify views, standard symbols and lines**

- Conventional representation of materials, machine parts and size of drawing sheets are identified
- Exterior and sectioned views of machine elements are interpreted
- Alphabet of lines are identified
- Part drawing of a machine component are identified
- assembled views for the part drawings of machine are identified
- Exploded view drawing of a machine is identified
- Drawing Conventions, codes and symbols are correctly identified and identified according to drawing standards

**LO.3 Interpret machine drawing**

- Component, assembly or object is interpreted as required
- Drawing symbols and codes are interpreted appropriately
- Dimensions and material requirements are identified, understood and followed as required
- Dimensional notations are interpreted according to specifications

## Annex: Resource Requirements

<b>MODULE TITLE:</b> Reading and interpreting Machine drawing				
Module code EIS AUM2 M02 0322				
<b>Item No.</b>	<b>Category/Item</b>	<b>Description/ Specifications</b>	<b>Quantity</b>	<b>Recommended Ratio (Item: Trainee)</b>
<b>A. Learning Materials</b>				
1.	TTLM	TTLM prepared by the Ministry of labor and organization	25 Pcs	1:1
2.	Reference Books			
2.1	Machine drawing 3 <sup>rd</sup> Edition	k. L. Narayana , p. kannaiyah , k. venketa	5 Pcs	1:5
2.2	Manual of Engineering Drawing 5 <sup>th</sup> Edition	Colin H .simmons, dennise E. maguire	5 Pcs	1:5
2.3	Mechanical Engineering Drawing 2 <sup>nd</sup> Edition	k.venkata reddy	5 Pcs	1:5
3.	Journals/Publication/Magazines			
<b>B. Learning Facilities &amp; Infrastructure</b>				
1	Class room	31.5 m <sup>2</sup>	1Pcs	1:25
2	Whit board/Blackboard	240 cm ×120 cm	1Pcs	1:25
3	Arm Chair	55cm × 100 cm ×70 cm	25Pcs	1:1
4	Workshop	(4× 25) m <sup>2</sup>	1Pcs	1:25
5	LCD	Standard	1Pcs	1:25
6	Laptop or Computer	32-bit OS; 3 GB RAM; Intel core i5 (Processor)	1Pcs	1:25
7	Library	Per section 105 – 180 m <sup>2</sup>	1Pcs	1:25
8	Printer	Laser type	1 Pcs	1:25
9	Photocopier	Non-coloured	1Pcs	1:25
<b>C. Consumable Materials</b>				
1	Printer toner/ink	Compatible with the existing printer	5 pcs	1:25
2	Photocopier ink/toner	Compatible with the existing printer	1Pcs	1:25
3	CD/DVD	RW	5 pcs	1:5
4	Paper	A4 80gms	5 reams	1:5
5	Dose	Blue, green, yellow and red	50 pcs	2:1
6	Bond paper	A4 size; 20 gsm	5 reams	1:5
7	Flip chart	Roll back	5 pads	1:5
8	Coloured pens	Blue, red, green and black colour	5 sets	1:5
9	Candies	Different colour	5 pack	1:5
<b>D. Tools and Equipment</b>				
1.	Set square, T-square, compass, divider, protractor, French curve	Set	25 pcs	1:1
2	Triangular scale	1m	5 pcs	1:5
3	Drawing board	50cm×35cm×15 cm	25 pcs	1:1

### LEARNING MODULE 03

**TVET-PROGRAMME TITLE:** Automotive Mechanics Level II

**MODULE TITLE :** Servicing Engine and associated System Assemblies

**MODULE CODE :** EIS AUM2 M03 0322

**NOMINAL DURATION :** 70hours

**MODULE DESCRIPTION :** This module covers the knowledge, skills and attitude required to carry out minor services in automotive engines and associated sub-system assemblies. The module involves preparing for the task, basic checking/testing to identify fault, remove, disassemble, replace worn or failed components and assemblies and reinstall. Additionally, this module covers performing post-service checks and documentation.

#### LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- LO1.** Prepare for work
- LO2.** Remove and disassembled system assembly
- LO3.** Replace/reassemble system assemblies
- LO4.** Clean up work area and maintain equipment

#### MODULE CONTENTS:

##### **LO1. Prepare for work**

- 1.1** Overview of engine and associated systems
  - 1.1.1** Engine mechanism and exterior parts
  - 1.1.2** Engine systems
- 1.2** Types of accessory drives related Components
  - 1.2.1** Water pumps
  - 1.2.2** Alternators
  - 1.2.3** AC compressors
  - 1.2.4** Power steering pumps
  - 1.2.5** Supercharger
- 1.3** Types and application of gaskets and sealants
- 1.4** Parts registration/identification number
- 1.5** Preparing service work activity plan
- 1.6** OHS and Hazard identification

##### **LO2. Remove and disassembled system assemblies**

- 2.1** Service and maintenance schedules and job order

## 2.2 Overview of service techniques

### 2.2.1 Visual checks

### 2.2.2 Sound/aural checks

### 2.2.3 Adjustment of system/components

## 2.3 Disassembling engine exterior assembly

## 2.4 Removing engine systems

## 2.5 Disassembling engine system assembly

### **LO3. Replace/reassemble system assemblies**

#### 3.1 Carrying out minor adjustments

#### 3.2 Assembling system components

#### 3.3 Conducting post-service/pre-delivery check

### **LO4. Clean up work area and maintain equipment**

#### 4.1 Reusing waste and scrap materials

#### 4.2 Safe handling and storage of hazardous goods and substances

#### 4.3 Inspecting and maintain tools equipment

#### 4.4 Workplace documentation and reporting

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO.1 Prepare for work**

- Technical documentation of wear limits and vehicle-specific features of components and system assembly are selected
- Nature and scope of necessary service work is identified
- Work plan is created
- Components, tooling and equipment are selected and prepared in accordance with work area.
- WHS requirements throughout the work including personal safety are observed

**LO.2 Remove and disassemble system assembly**

- Workplace procedures are demonstrated and manufacturer /component supplier specifications are followed
- Vehicle system assembly is removed
- Vehicle system assembly is disassembled

**LO.3 Replace and/or reassemble system assembly**

- Minor adjustments are carried out according to manufacturers' specifications
- New gaskets are produced and sealants are applied
- Particular procedures for assembling are implemented
- System assembly is fitted according to workplace procedures and manufacturer /component supplier specifications

**LO.4 Clean-up work area and maintain equipment**

- Material that can be reused is collected and stored (if any)
- Waste and scrap are removed following WHS rule
- Tools, equipment and work area are cleaned and inspected for serviceable condition
- Causes of fault on non-serviceable equipment are identified and tagged
- Tooling and equipment are maintained in accordance with workplace procedures

## Annex: Resource Requirements

<b>MODULE TITLE</b> : Servicing Engine and associated System Assemblies				
<b>MODULE CODE</b> : EIS AUM2 M03 0322				
<b>Item No.</b>	<b>Category/Item</b>	<b>Description/ Specifications</b>	<b>Quantity</b>	<b>Recommended Ratio (Item: Trainee)</b>
<b>A.</b>	<b>Learning Materials</b>			
1.	TTLM	TTTLM prepared by Ministry of labour and organization	25 Pcs	1:1
2.	Reference Books			
2.1	Auto motive mechanics 10 <sup>th</sup> edition	William H.Crouse	1 Pcs	1:5
2.2	Light & heavy vehicle technology	Fourth Edition	1 Pcs	1:5
2.3	Automotive technology A Systems Approach 7th Edition	Jack Erjavec Rob Thompson	1 Pcs	1:5
3.	Journals/Publication/Magazines			
<b>B.</b>	<b>Learning Facilities &amp; Infrastructure</b>			
1.	Class room	31.5 m <sup>2</sup>	1Pcs	1:25
2.	Whit board/Blackboard	240 cm ×120 cm	1Pcs	1:25
3.	Arm Chair	55cm × 100 cm ×70 cm	25Pcs	1:1
4.	Workshop	(4× 25)m <sup>2</sup>	1Pcs	1:25
5.	LCD	Standard	1Pcs	1:25
6.	Laptop or Computer	32-bit OS; 3 GB RAM; Intel core i5 (Processor)	1Pcs	1:25
7.	Library	Per section 105 – 180 m <sup>2</sup>	1Pcs	1:25
8.	Printer	Laser type	1 Pcs	1:25
9.	Photocopier	Non-coloured	1Pcs	1:25
<b>C.</b>	<b>Consumable Materials</b>			
1.	Printer toner/ink	Compatible with the existing printer	5 pcs	1:25
2.	Photocopier ink/toner	Compatible with the existing printer	1Pcs	1:25
3.	CD/DVD	RW	5 pcs	1:5
4.	Paper	A4 80gms	5 reams	1:5
5.	Dose	Blue, green, yellow and red	50 pcs	2:1
6.	Bond paper	A4 size; 20 gsm	5 reams	1:5
7.	Flip chart	Back roll	5 pads	1:5
8.	Relay	3-5 pin type	1	1:25
9.	Connecting terminals	Male & female	1set	1:25
10.	Cotton cloth	Meters	5	1:5
11.	Diesel fuel	Litters	25L	1:1
12.	Gasoline /petrol fuel	Litters	25L	1:1
13.	Engine oil	SAE 10W- 30 and SAE 15W-40	5L each	1:5
14.	Steering Oil	ATF	1L	1:25
15.	Lubricants	Oil#10 and 90	5L	1:5

16.	Coolants	Antifreeze and Antirust	5L	1:5
<b>D.</b>	<b><i>Tools and Equipment's</i></b>			
1.	Voltmeter	Digital	5	1:5
2.	Pliers and screw drivers	combination	5	1:5
3.	Wrenches	Chrome vanadium	1 Set	1:25
4.	Pliers	Chrome vanadium	1 Set	1:25
5.	Screw drivers	Chrome vanadium	1 Set	1:25
6.	Sockets and accessories	Chrome vanadium	1 Set	1:25
7.	Diesel Engine	Four strokes	1 PCS	1:25
8.	Gasoline Engine	Four strokes	1 PCS	1:25
9.	Oil filter wrench	Belt / chain type	5 PCS	1:5
10.	Hand tools	Mechanic box	5 PCS	1:5
11.	Bench	(12 x 2) m	5 PCS	1:5
12.	Apron	Lather	25 PCS	1:1
13.	Eye glass	White	25 PCS	1:1
14.	Glove	Lather	25 PCS	1:1
15.	Oil filter wrench	Belt / chain type	5 PCS	1:5

## LEARNING MODULE 04

**TVET-PROGRAMME TITLE:** Automotive Mechanics Level II

**MODULE TITLE :** Performing minor Engine Electrical Systems Service

**MODULE CODE :** EIS AUM2 M04 0222

**NOMINAL DURATION :** 70hours

**MODULE DESCRIPTION :** This module covers the knowledge, skill and attitude required to service engine electrical systems by using manufacturer's instructions and regulations.

### LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- LO1.** Prepare to test engine electrical systems
- LO2.** Test engine electrical system
- LO3.** Perform minor engine electrical system service
- LO4.** Clean up work area and maintain equipment

### MODULE CONTENTS:

#### **LO1. Prepare to test engine electrical systems Identifying scope of the work**

- 1.1. Overview of basic electricity/electronics
- 1.2. Electromagnetism and transformers
- 1.3. Operating principles of ignition system
- 1.4. Operating principles of starting system
- 1.5. Operating principles of charging system
- 1.6. Applying work place health safety (WHS)
- 1.7. Determining Workplace instructions and Job requirements

#### **LO2. Test engine electrical system**

- 2.1. Using testing instruments and SST
- 2.2. Common electrical faults
- 2.3. Testing Engine electrical systems faults
  - 2.3.1. Charging system
  - 2.3.2. Starting system
  - 2.3.3. Ignition systems
- 2.4. Reporting test results

#### **LO3. Perform minor engine electrical system service**

- 3.1. Applying proper service technique

3.1.1. Testing steps

3.1.2. Repairing steps

3.2. Repairing engine electrical circuit faults

3.3. Carrying out post service test

**LO4. Clean up work area and maintain equipment**

4.1 Cleaning work area

4.2 Reusing waste and scrap materials

4.3 Maintaining tools and equipment

4.4 Tagging and isolate faulty equipment

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO.1 Prepare to test engine electrical systems**

- Job requirements and appropriate Workplace instructions are determined
- Workplace Health and Safety (WHS) requirements are observed and applied throughout the work
- Procedures and information are sourced and interpreted
- Substantial Tools and equipment are identified for servicing work

**LO.2 Test engine electrical system**

- Necessary Test Instruments are used
- Engine electrical systems are tested and faults are identified following workplace procedures
- Test results are reported, including recommendations for necessary adjustments

**LO.3 Perform minor engine electrical system service**

- Appropriate Service technique is applied
- Appropriate tools and materials are used
- Identified faults are rectified following workplace procedures
- Post-service testing is carried out to confirm functionality of system under service

**LO.4 Clean-up work area and maintain equipment**

- Material that can be reused is collected and stored
- Waste and scrap are removed following workplace procedures
- Equipment and work area are cleaned and inspected for serviceable condition in accordance with workplace procedures
- Tools and equipment are maintained according to workplace procedures
- Faulty equipment is identified, tagged and isolated according to workplace procedures

## Annex: Resource Requirements

MODULE TITLE : Performing minor Engine Electrical Systems Service				
MODULE CODE : EIS AUM2 M04 0222				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
<b>A. Learning Materials</b>				
1.	TTLM	TTTLM prepared by Ministry of labor and organization	1 Pcs	1:25
2.	Reference Books			
2.1	Auto motive mechanics	William H.Crouse 10 <sup>th</sup> edition	1 Pcs	1:5
2.2	Light & heavy vehicle technology	Fourth Edition	1 Pcs	1:5
2.3	Automotive technology A Systems Approach 7th ed.	Jack Erjavec Rob Thompson	1 Pcs	1:5
3.	Journals/Publication/Magazines			
<b>B. Learning Facilities &amp; Infrastructure</b>				
1.	Class room	For lecture in 31.5 m <sup>2</sup>	1 Pcs	6:5
2.	Work shop	For practical activity (4× 25) m <sup>2</sup>	1 Pcs	4:1
3.	Work bench	Length x Width x Height (2m x 1.2m x0.78m)	5 Pcs	1:5
4.	White and/or black board	Length x Height (2.4m x 1.2m)	1 Pcs	1:25
5.	Arm chair	Length x Width x Height (1m x 0.55m x0.74m)	25 Pcs	1:1
6.	Chair (for trainer)	Length x Width x Height (0.4m x 0.56m x0.78m)	1 Pcs	1:25
7.	Table	Length x Width x Height (1.2m x 0.8m x0.74m)	1 Pcs	1:25
8.	Computer	(Desktop/Laptop)	1 Pcs	1:25
9.	LCD Projector		1 Pcs	1:25
10.	Class room	For lecture in (m <sup>2</sup> )	1	6:5
<b>C. Consumable Materials</b>				
1.	Cleaning rag	cotton	1 meter	1:25
2.	Bulbs	Set (6v&12v) Single and double filament	5Set	1:5
3.	Wire	(stranded) 1.5,2.5 and 8mm	5 Roll	1:5
4.	Soldering wax	10 gm	5Pcs	1:5
5.	Soldering lead	Rosin	5Roll	1:5
<b>D Tools and Equipment</b>				
1.	Soldering gun	80 w	5 Pcs	1:5
2.	Multi-meter	Digital	5 Pcs	1:5
3.	Test light	12-24V	5 Pcs	1:5
4.	Kerosine	Washing purpose	5Liter	1:25
5.	Sealants	Abrasive bond	1pcs	1:25

<b>LEARNING MODULE 05</b>	
<b>TVET-PROGRAMME TITLE:</b> Automotive Mechanics Level II	
<b>MODULE TITLE :</b> Servicing power train system	
<b>MODULE CODE :</b> EIS AUM2 M05 0322	
<b>NOMINAL DURATION :</b> 60 Hours	
<b>MODULE DESCRIPTION :</b> This module covers the knowledge, skills and attitude required to remove, check and refit automotive power train drive line assemblies. It involves minor inspections to identify deviations from correct operation, removal, disassembly and fitting procedures for main and interrelated components following manufacturer specification.	
<p><b>LEARNING OUTCOMES</b></p> <p>At the end of the module the trainees will be able to:</p> <p><b>LO1.</b> Prepare to remove power train drive line assemblies</p> <p><b>LO2.</b> Remove and inspect power train drive line assemblies</p> <p><b>LO3.</b> Service power train drive line assemblies</p> <p><b>LO4.</b> Clean up work area and finalise work processes</p>	
<p><b>MODULE CONTENTS:</b></p> <p><b>LO1. Prepare to remove power train drive line assemblies</b></p> <p>1.1 Overview of automotive powertrain</p> <p>1.1.1 Basic concepts of gear train</p> <p>1.1.2 Types of transmission</p> <p>1.1.3 Axle shafts and wheel bearing</p> <p>1.1.4 Drive shaft U-joint and CV-joints</p> <p>1.1.5 Operating principle of differential</p> <p>1.2 Workplace health and safety</p> <p>1.3 Preparing tools, equipment and materials</p> <p><b>LO2. Remove and inspect power train drive line assemblies</b></p> <p>2.1 Inspecting power train and drive line assemblies</p> <p>2.2 Inspecting mounting points and fittings</p> <p>2.3 Removing power train and drive line assemblies</p> <p>2.4 Reporting inspection findings</p>	

**LO3. Service power train drive line assemblies**

**3.1** Possible source of leakages

**3.2** Changing fluids and lubricants

**3.3** Servicing clutch system

**3.4** Servicing Shift lever Linkage and Speedometer Gear Drive

**3.5** Bleeding clutch hydraulic system

**3.6** Removing and replacing joints

**LO4. Maintain tools and equipment**

**4.1** Cleaning and storing tools and equipment

**4.2** Routine maintenance for hand tools

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO.1 Prepare to remove power train drive line assemblies**

- Workplace instructions are used to determine job requirements related to removal of power train and drive line assemblies
- Workplace Health and Safety (WHS) requirements are observed and applied throughout the work
- Procedures and information are sourced and interpreted
- Removal options appropriate to work circumstances are identified
- Appropriate tools and equipment are selected and prepared

**LO.2 Remove and inspect power train drive line assemblies**

- Power train and drive line assembly are removed according to workplace procedures and manufacturer /component supplier specifications
- Inspection of power train and drive line assemblies, mounting points and fittings for damage and wear is carried out
- Inspection findings are reported according to workplace procedures

**LO.3 Service power train drive line assemblies**

- Servicing options appropriate to work circumstances are identified
- Appropriate tools and equipment are selected and prepared
- Power train and drive line assembly are serviced according to workplace procedures and manufacturer /component supplier specifications
- Appropriate functionality of serviced assemblies is checked according to workplace procedures and manufacturer /component supplier specifications

**LO.4 Clean-up work area and finalise work processes**

- Material that can be reused is collected and stored (if any)
- Waste and scrap are removed following WHS rule
- Tools, equipment and work area are cleaned and inspected for serviceable condition
- Causes of fault on non-serviceable equipment are identified and tagged
- Tooling and equipment are maintained in accordance with workplace procedures

## Annex: Resource Requirements

MODULE TITLE : Servicing power train system				
MODULE CODE : EIS AUM2 M05 0322				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
<b>A. Learning Materials</b>				
1.	TTLM	TTLM prepared by the trainer	25 PCS	1:1
2.	Reference Books			
2.1	Auto motive mechanics 10 <sup>th</sup> edition	Crouse, W.H. and Anglin D.L.,	1 PCS	1:5
2.2	Light & heavy vehicle technology	Fourth Edition	1 PCS	1:5
2.3	Automobile Engineering	R.K Rajput	1 PCS	1:5
2.4	Brakes, Brake Control and Driver Assistance Systems	Prof. Dr.-Ing. Konrad Reif	5 PCS	1:5
2.5	Automotive Engineering	Edited by David A. Crolla	5 PCS	1:5
2.6	Light and Heavy Vehicle Technology 4 <sup>th</sup> ed.	Nunney, M. J.Rutledge, 2007	5 PCS	1:5
2.7	Automotive Technology: Principles, Diagnosis & Repair, and Service, 3 <sup>rd</sup> ed.,	Halderman, D., Prentice Hall, 2008.	5 PCS	1:5
2.8	Automotive Technology: A systems approach, 7 <sup>th</sup> ed.,	Erjavec, J., Delmar Cengage Learning, 2017	5 PCS	1:5
2.9	Automotive Repair and Maintenance	Abrahams, A., Pearson South Africa, 2008.	5 PCS	1:5
3.	Journals/Publication/Magazines			
<b>B. Learning Facilities &amp; Infrastructure</b>				
1	Class room	For lecture in 31.5(m <sup>2</sup> )	1 PCS	1:25
2	Work shop	For practical (4× 25) (m <sup>2</sup> )	1 PCS	4:1
3	Work bench	Length x Width x Height (2m x 1.2m x0.78m)	5 PCS	1:5
4	White and/or black board	Length x Height (2.4m x 1.2m)	1 PCS	1:25
5	Arm chair	Length x Width x Height (1m x 0.55m x0.74m)	25 PCS	1:1
6	Chair (for trainer)	Length x Width x Height (0.4m x 0.56m x0.78m)	1 PCS	1:1
7	Table	Length x Width x Height (1.2m x 0.8m x0.74m)	1 PCS	1:25
8	Computer	(Desktop/Laptop)	1 PCS	1:25
9	LCD Projector		1 PCS	1:25
10	Class room	For lecture in (m <sup>2</sup> )	1 PCS	6:5
<b>C. Consumable Materials</b>				

6.	Cotton cloth		5m	1:5
7.	Detergent	Ordinary washing	5liter	1:5
8.	grease	Multipurpose EA-3	1can	1:25
9.	Glue	Tire tube adhesive	1can	1:25
10.	Transmission oil	SAE-90	5Lit	1:5
11.	Differential oil	SAE-140	5Lit	1:5
12.	Clutch oil	DOT-3/4	1Lit	1:25
<b>D Tools and Equipment</b>				
<b>1 Hand tools</b>				
1	Wrenches	Different size	5 Set	1:5
2	Socket and ratchet	Different size	5 Set	1:5
3	Torque wrench	Mid-size	1Pcs	1:25
4	Pliers	Different size	5 Set	1:5
5	Screw drivers	Different size	5 Set	1:5
6	Hammers	Different size	1 Set	1:25
7	Cutters	Different size	1 Set	1:25
8	Chisels and punches	Different size	1 Set	1:25
9	Gears and bearing pullers	Different size	1 Set	1:25
<b>2 PCS</b>				
1	Impact wrench	Air/ electric power operated	5Pcs	1:5
2	Air drill	Electric power operated	5Pcs	1:5
3	Blowgun	Electric power operated	5Pcs	1:5
4	Ratchet	Air/ electric power operated	5Pcs	1:5
5	Jacks and lifts	Hydraulic power operated	5Pcs	1:5
<b>3 Measuring tools</b>				
1	Vernier caliper	0-100mm digital	5Pcs	1:5
2	Vernier caliper	0-100mm analog	5Pcs	1:5
3	Dial gauge	0.01/0.001	5Pcs	1:5
4	Micro meter	0-150mm	5Pcs	1:5
5	Try square	steel	5Pcs	1:5
6	Feeler gauge	0.05-100mm	5Pcs	1:5
7	Steel rule	1000mm	5Pcs	1:5
8	Measuring tape	1m×0.5m	5Pcs	1:5
<b>4 Measuring tools</b>				
1	Bench vises	Fixed on bench	1Pcs	1:25
2	Presses	hydraulic	5Pcs	1:5
3	Bench grinders	Electric power operated	1Pcs	1:25
4	Air pressure gauge	5 bar	5Pcs	1:5

<b>LEARNING MODULE 06</b>	
<b>TVET-PROGRAMME TITLE:</b> Automotive Mechanics level II	
<b>MODULE TITLE :</b> Performing minor under chassis systems service	
<b>MODULE CODE :</b> EIS AUM2 M06 0322	
<b>NOMINAL DURATION :</b> 60 Horus	
<b>MODULE DESCRIPTION :</b> This module covers the knowledge, skills and attitude required to carry out basic services of defects on automotive running gear assemblies such as steering suspension and brake systems. The module involves basic check/test to identify fault, removal, and disassembly, replacement of worn or failed components, reassembly and reinstallation according to workplace requirements	
<b>LEARNING OUTCOMES</b> At the end of the module the trainee will be able to: <b>LO1.</b> Prepare to undertake minor service to under chassis systems <b>LO2.</b> Conduct basic inspection/test <b>LO3.</b> Carry out minor repair <b>LO4.</b> Clean up work area and maintain the equipment	
<b>MODULE CONTENTS:</b> <b>LO1. Prepare to undertake minor service to under chassis systems</b> 1.1. Principles of hydraulics and pneumatics 1.2. Characteristics of friction materials 1.3. Types of brake systems 1.4. Overview of circuits and designations of pneumatic brake 1.5. Suspension system 1.6. Mechanical and hydraulic Steering systems <b>LO2. Conduct basic inspection/test</b> 2.1 Common faults of under chassis systems 2.2 Servicing techniques 2.3 inspecting suspensions system/components 2.4 Check power steering fluid 2.5 Checking steering system linkages 2.6 Checking hydraulic brake lines and components 2.7 Check brake fluid	

**LO3. Carry out minor repair**

- 3.1 Removing and replacing suspensions system/components
- 3.2 Removing replacing and adjusting steering system components
- 3.3 Removing and replacing hydraulic brake system/components
- 3.4 Applying different adjustment techniques on under chassis system

**LO4. Clean up work area and maintain the equipment**

- 4.1 Keeping work place equipment and tools properly
- 4.2 Handling brake fluid and asbestos materials

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

<b>ASSESSMENT METHODS:</b>				
<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
<b>Written test</b>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<b>Demonstration/ Observation</b>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO.1 Prepare to undertake minor service to under chassis systems**

- Workplace instructions that are used to determine job requirements related to under chassis systems are sourced
- Service options appropriate to work circumstances are identified
- Appropriate tools and equipment are selected and prepared
- WHS requirements throughout the work including personal safety are observed

**LO.2 Conduct basic inspection/test**

- Workplace Health and Safety (WHS) requirements are applied throughout the work
- Particular procedures are identified to inspect/test under chassis assemblies based on manufacturer/ component supplier specifications
- The suspension, brake and steering system assemblies are checked thoroughly
- Results are documented with evidence and supporting information

**LO.3 Carry out minor repair**

- Repair works are implemented in accordance with workplace procedures and manufacturer/component supplier specifications
- Removal, disassembly, check/inspection, reassembly and reinstallation are performed (if required)
- Adjustments are made during the repair in accordance with manufacturer/component supplier specifications

**LO.4 Clean-up work area and maintain the equipment**

- Material that can be reused is collected and stored (if any)
- Waste and scrap are removed following WHS rule
- Tools, equipment and work area are cleaned and inspected for serviceable condition
- Causes of fault on non-serviceable equipment are identified and tagged
- Tooling and equipment are maintained in accordance with workplace procedures

## Annex: Resource Requirements

MODULE TITLE : Performing minor under chassis systems service				
MODULE CODE : EIS AUM2 M06 0322				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
<b>A. Learning Materials</b>				
1.	TTLM	TTLM prepared by the Ministry of labor and organization	25 Pcs	1:1
<b>2. Reference Books</b>				
2.1	Brakes, Brake Control and Driver Assistance Systems	Prof. Dr.-Ing. Konrad Reif	5 Pcs	1:1
2.2	Automotive Engineering	Edited by David A. Crolla	5 Pcs	1:1
2.3	Light and Heavy Vehicle Technology	Nunney, M. J., 4th ed., Rutledge, 2007	5 Pcs	1:1
2.4	Automotive Technology: Principles, Diagnosis & Repair, and Service	Halderman, D., 3 <sup>rd</sup> ed., Prentice Hall, 2008.	5 Pcs	1:1
2.5	Automotive Technology: A systems approach	Erjavec, J., 7 <sup>th</sup> ed., Delmar Cengage Learning, 2017	5 Pcs	1:1
2.6	Automotive Mechanics	Crouse, W.H. and Anglin D.L., 10 <sup>th</sup> ed., McGraw-Hill Companies, 1993.	5 Pcs	1:1
2.7	Automotive Repair and Maintenance	Abrahams, A., Pearson South Africa, 2008.	5 Pcs	1:1
4.	Journals/Publication/Magazines			
<b>B. Learning Facilities &amp; Infrastructure</b>				
1.	Class room	(5×6)m <sup>2</sup>	1Pcs	1:25
2.	Technical Drawing Room	For drawing (5×6)m <sup>2</sup>	1 Pcs	1:25
3.	Work shop	For drawing (4×25)m <sup>2</sup>	1 Pcs	1:25
4.	Work bench	Length x Width x Height (2m x 1.2m x0.78m)	5 Pcs	1:5
5.	White and/or black board	Length x Height (2.4m x 1.2m)	1 Pcs	1:25
6.	Arm chair	Length x Width x Height (1m x 0.55m x0.74m)	25 Pcs	1:1
7.	Chair (for trainer)	Length x Width x Height (0.4m x 0.56m x0.78m)	1 Pcs	1:25
8.	Table	Length x Width x Height (1.2m x 0.8m x0.74m)	1 Pcs	1:25
9.	Computer	(Desktop/Laptop)	1 Pcs	1:25
10.	LCD Projector		1 Pcs	1:25
<b>C. Consumable Materials</b>				
1.	Rag/ cotton cloth	For wiping	1kg/1m	1:5



2.	Detergent	ordinary	5Lit	1:5
3.	Oil	Gear oil	25 L	1:5
4.	Grease	Standard	5 kg	1:1
5.	Brake fluid	Dot 3 /Dot 4	2.5 L	1:5
6.	Hydraulic fluid	Steering fluid	5 L	1:5
<b>D.</b>	<b>Tools and Equipment</b>			
1.	<b>Tools</b>			
2.	Hand tools	Mechanic tool box	5 Pcs	1:5
3.	Hammer	Sludge/ ball peen	5 Pcs	1:5
4.	Hammer	Plastic type	5 Pcs	1:5
5.	Plier	Combination	5 Pcs	1:5
6.	Plier	Long nose	5 Pcs	1:5
7.	Brake special tool	Kit	5 Pcs	1:5
2	<b>Equipment</b>			
	Bench	(12 x 2) m	5 Pcs	1:5
	Jack	Floor	5 Pcs	1:5
	Coil spring compressor	Standard	5 Pcs	1:5

<b>LEARNING MODULE 07</b>	
<b>TVET-PROGRAMME TITLE:</b> Automotive Mechanics Level II	
<b>MODULE TITLE :</b> Carrying out Wheel Alignment	
<b>MODULE CODE :</b> EIS AUM2 M07 0321	
<b>NOMINAL DURATION :</b> .60 Hours	
<b>MODULE DESCRIPTION :</b> This module covers the knowledge, skills and attitude required to carry out wheel alignment operations. The module involves basic check/test, alignment equipment installation, measurement and adjustment according to workplace requirements. Additionally, this module covers performing post-service checks and documentation.	
<p><b>LEARNING OUTCOMES</b></p> <p>At the end of the module the trainee will be able to:</p> <p><b>LO1.</b> Carry out wheel alignment pre-checks</p> <p><b>LO2.</b> Perform wheel alignment</p> <p><b>LO3.</b> Clean up work area and maintain equipment</p>	
<p><b>MODULE CONTENTS:</b></p> <p><b>LO1. Carry out wheel alignment pre-checks</b></p> <p>    <b>1.1</b> Identifying wheel alignment requirements</p> <p>    <b>1.2</b> Performing pre-alignment inspection</p> <p>        <b>1.2.1</b> Checking tire pressure and loading condition</p> <p>        <b>1.2.2</b> Correcting tire and rim size</p> <p>        <b>1.2.3</b> Measuring and Adjusting Ride Height</p> <p>        <b>1.2.4</b> Interpreting Results of Poor Alignment</p> <p>    <b>1.3</b> Testing vehicle to confirm need for alignment</p> <p>    <b>1.4</b> Interpreting manufacturer/component supplier specifications</p> <p>    <b>1.5</b> Alignment Angle Diagnostic Chart</p> <p><b>LO2. Perform wheel alignment</b></p> <p>    <b>2.1</b> Types of wheel alignment</p> <p>    <b>2.2</b> Calibrating Wheel Alignment Equipment</p> <p>    <b>2.3</b> Measuring Alignment Geometry</p> <p>        <b>2.3.1</b> Camber and Caster</p> <p>        <b>2.3.2</b> Toe-in and Toe-out</p> <p>        <b>2.3.3</b> Included Angle and Steering axis inclination</p> <p>        <b>2.3.4</b> Scrub and Turning Radius</p>	

## **2.4 Performing an Alignment**

### **2.4.1 Machine Care**

### **2.4.2 Gauges and miscellaneous Tools**

### **2.4.3 Interpreting Specifications**

### **2.4.4 Adjusting Caster and Camber**

### **2.4.5 Toe Adjustment**

### **2.4.6 Rear-Wheel Adjustments**

## **LO3. Clean up work area and maintain equipment**

### **3.1 Removing waste and scrap**

### **3.2 Identifying and tagging faulty tools and equipment**

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

**ASSESSMENT METHODS:**

<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
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<p><b>Written test</b></p>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<p><b>Demonstration/ Observation</b></p>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO1. Carry out wheel alignment pre-checks**

- Nature and scope of work requirements are identified and confirmed
- Procedures and information such as workshop manuals and specifications, and tooling required, are sourced
- Vehicle tests are performed to confirm need for alignment using test equipment
- Pre-checks are carried out in accordance with manufacturer/ component supplier procedures and workplace requirements

**LO2. Perform wheel alignment**

- Correct information is accessed and interpreted from manufacturer/component supplier specifications
- Wheel alignment measuring equipment is connected to vehicle in accordance with manufacturer/component supplier specifications
- Wheel alignment angles are measured and recorded properly
- Wheel alignment adjustment is carried out according to industry regulations/guidelines, WHS legislation and enterprise procedures/policies
- Workplace documentation is completed and dealt with relevant alignment outcomes

**LO4. Clean up work area and maintain equipment**

- Material that can be reused is collected and stored (if any)
- Waste and scrap are removed following WHS rule
- Tools, equipment and work area are cleaned and checked for serviceable condition
- Causes of fault on non-serviceable equipment are identified and tagged
- Tooling and equipment are maintained in accordance with workplace procedures

## Annex: Resource Requirements

<b>MODULE TITLE</b> : Carrying out Wheel Alignment				
<b>MODULE CODE</b> : EIS AUM2 M07 0321				
<b>Item No.</b>	<b>Category/Item</b>	<b>Description/ Specifications</b>	<b>Quantity</b>	<b>Recommended Ratio (Item: Trainee)</b>
<b>A.</b>	<b><i>Learning Materials</i></b>			
1.	TTLM	Prepared by the Ministry of labour and Skills	25 Pcs	1:1
2	Reference and Text books			
2.1	Light and Heavy Vehicle Technology 4th ed.	Nunney, M. J Rutledge, 2007	5 Pcs	1:1
2.2	Automotive Technology: Principles, Diagnosis & Repair, and Service 3 <sup>rd</sup> ed.	Halderman, D. Prentice Hall, 2008.	5 Pcs	1:1
2.3	Automotive Technology: A systems approach 7 <sup>th</sup> ed.	Erjavec, J. Delmar Cengage Learning, 2017	5 Pcs	1:1
2.4	Automotive Mechanics 10 <sup>th</sup> ed.	Crouse, W.H. and Anglin D.L., , McGraw-Hill Companies, 1993.	5 Pcs	1:1
2.5	Automotive Repair and Maintenance	Abrahams, A., Pearson South Africa, 2008.	5 Pcs	1:1
2.5	Service Manuals	(TOYOTA, Nissan)	5 Pcs	1:1
4.	Journals/Publication/Magazines			
<b>B.</b>	<b><i>Learning Facilities &amp; Infrastructure</i></b>			
1.	Class room	For lecture in 31.5 m <sup>2</sup>	1 Pcs	1:25
2.	Work shop	For practical (4× 25) m <sup>2</sup>	1 Pcs	4:1
3.	Work bench	Length x Width x Height (2m x 1.2m x 0.78m)	5 Pcs	1:5
4.	White and/or black board	Length x Height (2.4m x 1.2m)	1 Pcs	1:25
5.	Arm chair	Length x Width x Height (1m x 0.55m x 0.74m)	25 Pcs	1:1
6.	Chair (for trainer)	Length x Width x Height (0.4m x 0.56m x 0.78m)	1 Pcs	1:25
7.	Table	Length x Width x Height (1.2m x 0.8m x 0.74m)	1 Pcs	1:25
8.	Computer	(Desktop/Laptop)	1 Pcs	1:25
9.	LCD Projector		1 Pcs	1:25
<b>C.</b>	<b><i>Consumable Materials</i></b>			
1.	Cotton cloth		5m	1:5
2.	Detergent	Ordinary washing	5liter	1:5

3.	grease	Multipurpose EA-3	1can	1:25
<b>D.</b>	<b>Tools and Equipment</b>			
<b>1.</b>	<b>Hand tools</b>			
1.	Wrenches	Different size	5 Set	1:5
2.	Socket and ratchet	Different size	5 Set	1:5
3.	Torque wrench	Mid-size	1Pcs	1:25
4.	Pliers	Different size	5 Set	1:5
5.	Screw drivers	Different size	5 Set	1:5
6.	Hammers	Different size	1 Set	1:25
7.	Cutters	Different size	1 Set	1:25
8.	Chisels and punches	Different size	1 Set	1:25
9.	Gears and bearing pullers	Different size	1 Set	1:25
10.	Wrenches	Different size	5 Set	1:5
<b>2</b>	<b>Power tools</b>			
1.	Impact wrench	Air/ electric power operated	5Pcs	1:5
2.	Air drill	Electric power operated	5Pcs	1:5
3.	Blowgun	Electric power operated	5Pcs	1:5
4.	Ratchet	Air/ electric power operated	5Pcs	1:5
5.	Jacks and lifts	Hydraulic power operated	5Pcs	1:5
<b>3</b>	<b>Measuring tools</b>			
3.1	Vernier caliper	0-100mm digital	5Pcs	1:5
3.2	Vernier caliper	0-100mm analog	5Pcs	1:5
3.3	Dial gauge	0.01/0.001	5Pcs	1:5
3.4	Micro meter	0-150mm	5Pcs	1:5
3.5	Try square	steel	5Pcs	1:5
3.6	Feeler gauge	0.05-100mm	5Pcs	1:5
3.7	Steel rule	1000mm	5Pcs	1:5
3.8	Measuring tape	1m×0.5m	5Pcs	1:5
<b>4</b>	<b>Equipment</b>			
1.	Bench vises	Fixed on bench	1Pcs	1:25
2.	Presses	hydraulic	5Pcs	1:5
3.	Bench grinders	Electric power operated	1Pcs	1:25
4.	Wheel Alignment Machine	Computerized	1Pcs	1:25
5.	Air pressure gauge	5 bar	5Pcs	1:5

## LEARNING MODULE 08

**TVET-PROGRAMME TITLE:** Automotive Mechanics Level II

**MODULE TITLE :** Servicing Two and Three Wheeler Vehicle Assemblies

**MODULE CODE :** EIS AUM2 M08 0322

**NOMINAL DURATION :** 80hours

**MODULE DESCRIPTION :** This module covers the knowledge, skills and attitude required to carry out minor services on two and three wheeler vehicle assemblies by identifying required tasks and integrating them into work process. The module involves preparing for the task, basic checking/testing to identify fault, remove, disassemble, replace worn or failed components and assemblies and reinstall. Additionally, this module covers performing post-service checks and documentation.

### LEARNING OUTCOMES

At the end of the module the trainee will be able to:

**LO1.** Prepare for work

**LO2.** Remove disassemble check/test system assemblies

**LO3.** Replace/reassemble system assemblies

**LO4.** Clean up work area and maintain equipment

### MODULE CONTENTS:

#### **LO1. Prepare to service three and two wheelers**

**1.1** Introducing electrical / mechanical aggregates of two/three wheelers

**1.1.1** Two/Four-stroke gasoline/diesel engines

**1.1.2** Engine systems

**1.1.3** Types of two/three-wheeler ignition system

**1.1.4** Kick and Self-starter system

**1.1.5** Lighting and auxiliary electrical system layout

**1.1.6** Main components of chassis and Sub systems

**1.1.7** Different drive layouts and control systems

**1.1.8** Clutch, Gear box, continuously variable Transmission

**1.2** Sourcing and utilizing workshop manual

#### **LO2. Remove disassemble check/test system assemblies**

**2.1** Visual checks and functional assessments

**2.2** Removing electrical and mechanical aggregates

**2.3** Disassembling electrical and mechanical aggregates

**2.4** Calibrating and adjusting settings

- 2.4.1 Mechanical aggregates
- 2.4.2 Gear shifting and control systems
- 2.4.3 Electrical/electronic systems

**LO3. Replace/reassemble system assemblies**

- 3.1 Identifying Particular assembly procedures
- 3.2 Replacing techniques
- 3.3 Applying sealants and gaskets
- 3.4 Performing post assembly test

**LO4. Clean up work area and maintain equipment**

- 4.1 Removing waste and scrap
- 4.2 Processing job card and documentation
- 4.3 Identifying and tagging techniques of faulty tools and equipment

<b>Learning Methods:</b>				
<b>For none impaired trainees</b>	<b>Reasonable Adjustment for Trainees with Disability (TWD)</b>			
	<b>Low Vision</b>	<b>Deaf</b>	<b>Hard of hearing</b>	<b>Physical impairment</b>
<b>Lecture-discussion</b>	<ul style="list-style-type: none"> <li>❖ Provide large print text</li> <li>❖ Prepare the lecture in <b>Audio/video</b></li> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Write short notes on the black/white board using large text</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Use normal tone of voice</li> <li>❖ Encourage trainees to record the lecture in audio format</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign sign language interpreter</li> <li>❖ Arrange the class room seating to be conducive for eye-to-eye contact</li> <li>❖ Make sure the luminosity of the light of class room is kept</li> <li>❖ Introduce new and relevant vocabularies</li> <li>❖ Use short and clear sentences</li> <li>❖ Give emphasis on visual lecture and ensure the attention of the trainees</li> <li>❖ Avoid movement during lecture time</li> <li>❖ Present the lecture in video format</li> <li>❖ Summarize main points</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible to trainees</li> <li>❖ Speak loudly</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Present the lecture in video format</li> <li>❖ Ensure the attention of the trainees</li> </ul>	<ul style="list-style-type: none"> <li>❖ Organize the class room seating arrangement to be accessible for wheelchairs users.</li> <li>❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note</li> <li>❖ Provide Orientation on the physical feature of the work shop</li> </ul>

<b>Demonstration</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up</li> <li>❖ Use verbal description</li> <li>❖ Provide special attention in the process of guidance</li> <li>❖ facilitate the support of peer trainees</li> <li>❖ Prepare &amp; use simulation</li> </ul>	<ul style="list-style-type: none"> <li>❖ use Sign language interpreter</li> <li>❖ Use video recorded material</li> <li>❖ Ensure attention of the trainees</li> <li>❖ Provide structured training</li> <li>❖ Show clear and short method</li> <li>❖ Use gesture</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Illustrate in clear &amp; short method</li> <li>❖ Use Video recorded material</li> <li>❖ Ensure the attention of the trainees</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate and support the trainees having severe upper limbs impairment to operate equipment's/ machines</li> <li>❖ Assign peer trainees to assist</li> <li>❖ Conduct close follow up</li> <li>❖ Provide tutorial support (If necessary)</li> </ul>
<b>Group discussion</b>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Brief the thematic issues of the work</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreters</li> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> </ul>	<ul style="list-style-type: none"> <li>❖ Facilitate the integration of trainees with group members</li> <li>❖ Conduct close follow up</li> <li>❖ Introduce the trainees with another group member</li> <li>❖ Inform the group members to speak loudly</li> </ul>	<ul style="list-style-type: none"> <li>❖ Introduce the trainees with their peers</li> </ul>

<b>Exercise</b>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/practical training</li> <li>❖ Introduce new and relevant vocabularies</li> </ul>	<ul style="list-style-type: none"> <li>❖ Conduct close follow up and guidance</li> <li>❖ Provide tutorial support if necessary</li> <li>❖ provide special attention in the process/ practical training</li> </ul>	<ul style="list-style-type: none"> <li>❖ Assign peer trainees</li> <li>❖ Use additional nominal hours if necessary</li> </ul>
<b>Individual assignment</b>	<ul style="list-style-type: none"> <li>❖ prepare the assignment questions in large text</li> <li>❖ Encourage the trainees to prepare and submit the assignment in large texts</li> <li>❖ Make available recorded assignment questions</li> <li>❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide briefing /orientation on the assignment</li> <li>❖ Provide visual recorded material</li> </ul>	

**ASSESSMENT METHODS:**

<b>Interview</b>		<ul style="list-style-type: none"> <li>❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter</li> <li>❖ Use short and clear questioning</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Speak loudly</li> <li>❖ Using sign language interpreter if necessary</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use written response as an option for the trainees having speech challenges</li> </ul>
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<p><b>Written test</b></p>	<ul style="list-style-type: none"> <li>❖ Prepare the exam in large texts</li> <li>❖ Use interview as an option if necessary</li> <li>❖ Prepare the exam in audio format</li> <li>❖ Assign human reader</li> <li>❖ (If necessary)</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers</li> <li>❖ Avoid essay writing</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use oral response as an option to give answer for trainees having severe upper limb impairment</li> <li>❖ Time extension for trainees having severe upper limb impairment</li> </ul>
<p><b>Demonstration/ Observation</b></p>	<ul style="list-style-type: none"> <li>❖ Brief the instruction or provide them in large text</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Use sign language interpreter</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Provide activity-based/ practical assessment method</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Brief on the instruction of the exam</li> <li>❖ Use loud voice</li> <li>❖ Time extension</li> </ul>	<ul style="list-style-type: none"> <li>❖ Provide activity-based assessment</li> <li>❖ Conduct close follow up</li> <li>❖ Time extension</li> </ul>

**ASSESSMENT CRITERIA:**

**LO1. Prepare to service three and two wheelers**

- Technical documentation of wear limits and vehicle-specific features of components and system assembly are selected
- Nature and scope of failure profiles and necessary service work is identified
- Work plan is created
- Components, tooling and equipment are selected and prepared in accordance with work area.

WHS requirements, including personal safety are observed throughout the work

**LO2. Dismount, check/test and remount on wheel**

- Workplace procedures are demonstrated and manufacturer /component supplier specifications are followed
  - Two and three-wheeler system assembly is removed
  - Two and three-wheeler system assembly is disassembled
- Condition of disassembled parts is tested/checked against manufacturer /component supplier specifications

**LO3. Replace/reassemble system assemblies**

- Minor adjustments are carried out according to manufacturers' specifications
- Particular procedures for assembling are implemented
- System assembly is fitted according to workplace procedures and manufacturer /component supplier specifications

**LO4. Clean up work area and maintain equipment**

- Material that can be reused is collected and stored (if any)
- Waste and scrap are removed following workplace procedures
- Tools, equipment and work area are cleaned and inspected for serviceable condition
- Causes of fault on non-serviceable equipment are identified and tagged
- Tooling and equipment are maintained in accordance with workplace procedures

## Annex: Resource Requirements

<b>MODULE TITLE : Servicing Two and Three Wheeler Vehicle Assemblies</b>				
<b>MODULE CODE : EIS AUM2 M08 0322</b>				
<b>Item No.</b>	<b>Category/Item</b>	<b>Description/ Specifications</b>	<b>Quantity</b>	<b>Recommended Ratio (Item: Trainee)</b>
<b>A. Learning Materials</b>				
1.	TTLM	Prepared by Ministry of Labour and Skills	25 Pcs	1:1
2	Reference and Text books			
2.1	Light and Heavy Vehicle Technology	Nunney, M. J., 4th ed., Rutledge, 2007	5 Pcs	1:5
2.2	Automotive Technology: Principles, Diagnosis & Repair, and Service	Halderman, D., 3 <sup>rd</sup> ed., Prentice Hall, 2008.	5 Pcs	1:5
2.3	Automotive Technology: A systems approach 7 <sup>th</sup> ed.	Erjavec, J. Delmar Cengage Learning, 2017	5 Pcs	1:5
2.4	Automotive Mechanics 10 <sup>th</sup> ed.	Crouse, W.H. and Anglin D.L. McGraw-Hill Companies, 1993.	5 Pcs	1:5
2.5	Automotive Repair and Maintenance	Abrahams, A., Pearson South Africa, 2008.	5 Pcs	1:5
2.5	Service Manuals	(TOYOTA, Nissan)	5 Pcs	1:5
4.	Journals/Publication/Magazines			
<b>B. Learning Facilities &amp; Infrastructure</b>				
1.	Class room	For lecture in 31.5 m <sup>2</sup>	1 Pcs	1:25
2.	Work shop	For practical (4x 25) m <sup>2</sup>	1 Pcs	4:1
3.	Work bench	Length x Width x Height (2m x 1.2m x 0.78m)	5 Pcs	1:5
4.	White and/or black board	Length x Height (2.4m x 1.2m)	1 Pcs	1:25
5.	Arm chair	Length x Width x Height (1m x 0.55m x 0.74m)	25 Pcs	1:1
6.	Chair (for trainer)	Length x Width x Height (0.4m x 0.56m x 0.78m)	1 Pcs	1:25
7.	Table	Length x Width x Height (1.2m x 0.8m x 0.74m)	1 Pcs	1:25
8.	Computer	(Desktop/Laptop)	1 Pcs	1:25
9.	LCD Projector		1 Pcs	1:25
<b>C. Consumable Materials</b>				
1.	Rag	Cotton cloth	5m	1:5
2.	Detergent	Ordinary washing	5liter	1:5
3.	grease	Multipurpose EA-3	1can	1:25
4.	Tip-top	Tire tube repair kit	25pcs	1:1
5.	Glue	Tire tube adhesive	1can	1:25

<b>D.</b>	<b>Tools and Equipment</b>			
<b>1.</b>	<b>Hand tools</b>			
1.1	Wrenches	Different size	5 Set	1:5
1.2	Socket and ratchet	Different size	5 Set	1:5
1.3	Torque wrench	Mid-size	1Pcs	1:25
1.4	Pliers	Different size	5 Set	1:5
1.5	Screw drivers	Different size	5 Set	1:5
1.6	Hammers	Different size	1 Set	1:25
1.7	Cutters	Different size	1 Set	1:25
1.8	Chisels and punches	Different size	1 Set	1:25
1.9	Gears and bearing pullers	Different size	1 Set	1:25
1.10	Wrenches	Different size	5 Set	1:5
<b>2</b>	<b>Power tools</b>			
2.1	Impact wrench	Air/ electric power operated	5Pcs	1:5
2.2	Air drill	Electric power operated	5Pcs	1:5
2.3	Blowgun	Electric power operated	5Pcs	1:5
2.4	Ratchet	Air/ electric power operated	5Pcs	1:5
2.5	Jacks and lifts	Hydraulic power operated	5Pcs	1:5
<b>3</b>	<b>Measuring tools</b>			
3.1	Vernier caliper	0-100mm digital	5Pcs	1:5
3.2	Vernier caliper	0-100mm analogue	5Pcs	1:5
3.3	Dial gauge	0.01/0.001	5Pcs	1:5
3.4	Micro meter	0-150mm	5Pcs	1:5
3.5	Try square	steel	5Pcs	1:5
3.6	Feeler gauge	0.05-100mm	5Pcs	1:5
3.7	Steel rule	1000mm	5Pcs	1:5
3.8	Measuring tape	1m×0.5m	5Pcs	1:5
<b>4</b>	<b>Equipment</b>			
4.1	Bench vies	Fixed on bench	1Pcs	1:25
4.2	Presses	hydraulic	5Pcs	1:5
4.3	Bench grinders	Electric power operated	1Pcs	1:25
4.4	Wheel Alignment Machine	Computerized	1Pcs	1:25
4.5	Air pressure gauge	5 bars	5Pcs	1:5
4.6	Motorcycle	Functional	1Pcs	1:25
4.7	Tricycle (Three-wheeler vehicle)	Functional	1Pcs	1:25

### **Acknowledgement**

The Ministry of Labour and Skills wishes to thank and appreciate trainers who donated their effort and time to develop this outcome-based curriculum for the TVET program Automotive Mechanics Level II. We also thank all regional TVET Bureaus and Colleges, Federal TVET Institute, Ethiopian Defence Engineering College, Ethiopian Management Institute and program facilitators for their active facilitation of their trainers for the development of this curriculum.

**The trainers who developed the curriculum**

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