



education

Department:
Education
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NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

AUTOMOTIVE REPAIR AND MAINTENANCE

NQF Level 4

September 2007

AUTOMOTIVE REPAIR AND MAINTENANCE – LEVEL 4

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SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Automotive Repair and Maintenance in the National Certificates (Vocational). It must be read with the *National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF)*. This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the *Subject Guidelines: Automotive Repair and Maintenance* to prepare for and deliver Automotive Repair and Maintenance. Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

1 ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

- Create an integrated national framework for learning achievements.
- Facilitate access to and progression within education, training and career paths.
- Enhance the quality of education and training.
- Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
- Contribute to the holistic development of the student by addressing:
 - social adjustment and responsibility;
 - moral accountability and ethical work orientation;
 - economic participation; and
 - nation-building.

The principles that drive these objectives are:

- **Integration**

To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

- **Relevance**

To be dynamic and responsive to national development needs.

- **Credibility**

To demonstrate national and international value and recognition of qualification and acquired competencies and skills.

- **Coherence**

To work within a consistent framework of principles and certification.

- **Flexibility**

To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

- **Participation**

To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

- **Access**

To address barriers to learning at each level to facilitate students' progress.

- **Progression**

To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

- **Portability**

To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

- **Articulation**

To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

- **Recognition of Prior Learning**

To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

- **Validity of assessments**

To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:

- clearly stating the outcome to be assessed;
- selecting the appropriate or suitable evidence;
- matching the evidence with a compatible or appropriate method of assessment; and
- selecting and constructing an instrument(s) of assessment.

- **Reliability**

To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the interpretation of evidence; therefore, careful monitoring of assessment is vital.

- **Fairness and transparency**

To verify that no assessment process or method(s) hinders or unfairly advantages any student. The following could constitute unfairness in assessment:

- Inequality of opportunities, resources or teaching and learning approaches
- Bias based on ethnicity, race, gender, age, disability or social class
- Lack of clarity regarding Learning Outcome being assessed
- Comparison of students' work with other students, based on learning styles and language

- **Practicability and cost-effectiveness**

To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS

The assessment structure for the National Certificates (Vocational) qualification is as follows:

2.1 Internal continuous assessment (ICASS)

Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. The internal continuous assessment (ICASS) practical component is undertaken in a real workplace, a workshop or a "Structured Environment". This component is moderated internally and externally quality assured by Umalusi. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes.

2.2 External summative assessment (ESASS)

The external summative assessment is either a single or a set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.

A compulsory component of external summative assessment (ESASS) is the **integrated summative assessment task (ISAT)**. This assessment task draws on the students' cumulative learning throughout the year. The task requires **integrated application of competence** and is executed under strict assessment conditions. The task should take place in a simulated or "Structured Environment". The integrated summative assessment task (ISAT) is the most significant test of students' ability to apply acquired knowledge.

The integrated assessment approach allows students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

3 MODERATION OF ASSESSMENT

3.1 Internal moderation

Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) college. Internal college moderation is a continuous process. The moderator's involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

3.2 External moderation

External moderation is conducted by the Department of Education, Umalusi and, where relevant, an Education and Training Quality Assurance (ETQA) body according to South African Qualifications Authority (SAQA) and Umalusi standards and requirements.

The external moderator:

- monitors and evaluates the standard of all summative assessments;
- maintains standards by exercising appropriate influence and control over assessors;
- ensures proper procedures are followed;
- ensures summative integrated assessments are correctly administered;
- observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
- gives written feedback to the relevant quality assessor; and
- moderates in case of a dispute between an assessor and a student.

Policy on inclusive education requires that assessment procedures be customised for students who experience barriers to learning, and supported to enable these students to achieve their maximum potential.

4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the *National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational)*.

The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

5 ASSESSOR REQUIREMENTS

Assessors must be subject specialists and should ideally be declared competent against the standards set by the ETDP SETA. If the lecturer conducting the assessments has not been declared a competent assessor, an assessor who has been declared competent may be appointed to oversee the assessment process to ensure the quality and integrity of assessments.

6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.

6.1 Baseline assessment

At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

6.2 Diagnostic assessment

This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

6.3 Formative assessment

This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

6.4 Summative assessment

This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

7.1 Collecting evidence

The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

7.2 Recording

Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

7.3 Reporting

All the evidence is put together in a report to deliver a decision for the subject.

8 METHODS OF ASSESSMENT

Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.

LECTURER ASSESSMENT	The lecturer assesses students' performance against given criteria in different contexts, such as individual work, group work, etc.
SELF-ASSESSMENT	Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.
PEER ASSESSMENT	Students assess another student's or group of students' performance against given criteria in different contexts, such as individual work, group work, etc.
GROUP ASSESSMENT	Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for assessment purposes is kept or recorded in the student's PoE.

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

	METHODS FOR COLLECTING EVIDENCE		
	Observation-based (Less structured)	Task-based (Structured)	Test-based (More structured)
Assessment instruments	<ul style="list-style-type: none"> • Observation • Class questions • Lecturer, student, parent discussions 	<ul style="list-style-type: none"> • Assignments or tasks • Projects • Investigations or research • Case studies • Practical exercises • Demonstrations • Role-play • Interviews 	<ul style="list-style-type: none"> • Examinations • Class tests • Practical examinations • Oral tests • Open-book tests
Assessment tools	<ul style="list-style-type: none"> • Observation sheets • Lecturer's notes • Comments 	<ul style="list-style-type: none"> • Checklists • Rating scales • Rubrics 	<ul style="list-style-type: none"> • Marks (e.g. %) • Rating scales (1-7)
Evidence	<ul style="list-style-type: none"> • Focus on individual students • Subjective evidence based on lecturer observations and impressions 	<p>Open middle: Students produce the same evidence but in different ways.</p> <p>Open end: Students use same process to achieve different results.</p>	Students answer the same questions in the same way, within the same time.

10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

Rating scales are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

Task lists and **checklists** show the student what needs to be done. These consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

Rubrics are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. Using rubrics is a different way of assessing and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly two types of rubrics, namely holistic and analytical, are used.

11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used.

Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

12 COMPETENCE DESCRIPTIONS

All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against rubrics and not be simply a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) that a student must demonstrate to achieve each level of the rating scale.

When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.

13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

13.1 Record sheets

The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students' interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

13.2 Checklists

Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.

SECTION C: ASSESSMENT IN AUTOMOTIVE REPAIR AND MAINTENANCE

1 SCHEDULE OF ASSESSMENT

At NQF levels 2, 3 and 4, lecturers will conduct assessments as well as develop a schedule of formal assessments that will be undertaken in the year. All three levels also have an external examination that accounts for 50 percent of the total mark. The marks allocated to assessment tasks completed during the year, kept or recorded in a PoE account for the other 50 percent.

The PoE and the external assessment include practical and written components. The practical assessment in Automotive Repair and Maintenance must, where necessary, be subjected to external moderation by Umalusi or an appropriate Education and Training Quality Assurance (ETQA) body, appointed by the Umalusi Council in terms of Section 28(2) of the *General and Further Education and Training Quality Assurance Act, 2001 (Act No. 58 of 2001)*.

2 RECORDING AND REPORTING

Automotive Repair and Maintenance, as is the case for all the other Vocational subjects, is assessed according to five levels of competence. The level descriptions are explained in the following table.

Scale of Achievement for the Vocational component

RATING CODE	RATING	MARKS %
5	Outstanding	80-100
4	Highly Competent	70-79
3	Competent	50-69
2	Not yet competent	40-49
1	Not achieved	0-39

The programme of assessment should be recorded in the Lecturer's Portfolio of Assessment for each subject. The following at least should be included in the Lecturer's Assessment Portfolio:

- A contents page
- The formal schedule of assessment
- The requirements for each assessment task
- The tools used for each assessment task
- Recording instrument(s) for each assessment task
- A mark sheet and report for each assessment task

The college must standardise these documents.

The student's PoE must include at least:

- A contents page
- The assessment tasks according to the assessment schedule
- The assessment tools or instruments for the task
- A record of the marks (and comments) achieved for each task

Where a task cannot be contained as evidence in the PoE, its exact location must be recorded and it must be readily available for moderation purposes.

ASSESSMENT OF AUTOMOTIVE REPAIR AND MAINTENANCE

LEVEL 4

3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN AUTOMOTIVE REPAIR AND MAINTENANCE - LEVEL 4

Topic 1: Test, diagnose, and rectify faults in an electronic fuel injection (EFI) system on an engine

SUBJECT OUTCOME	
1.1 Test and diagnose faults in an EFI system on an engine.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Safe working practices are observed throughout the task. 	<ul style="list-style-type: none"> Observe safe working practices throughout the task.
<ul style="list-style-type: none"> The fuel system and the engine compartment are checked visually to ensure no obvious faults exist. 	<ul style="list-style-type: none"> Check the fuel system and the engine compartment visually to ensure no obvious faults exist.
<ul style="list-style-type: none"> Suitable equipment is selected and used to enable system tests to be completed. 	<ul style="list-style-type: none"> Select and use suitable equipment to enable system tests to be completed.
<ul style="list-style-type: none"> No damage is caused to circuit components and electronic devices when using test instruments. 	<ul style="list-style-type: none"> Use test instruments without causing damage to circuit components and electronic devices.
<ul style="list-style-type: none"> The self-test codes are activated, read, and interpreted to identify any circuit that has a fault. 	<ul style="list-style-type: none"> Activate, read and interpret the self-test codes and identify any circuit that has a fault.
<ul style="list-style-type: none"> The circuit indicated by the self-test codes is tested, and the fault is located and identified. 	<ul style="list-style-type: none"> Test the circuit indicated by the self-test codes and locate and identify the fault.
<ul style="list-style-type: none"> EFI circuits not monitored by the self-test system are tested, and any faults are located and identified. 	<ul style="list-style-type: none"> Test the EFI circuits not monitored by the self-test system, and identify and locate any faults.
<ul style="list-style-type: none"> The air intake system is checked for blockages and leaks and to determine if it is operating correctly. 	<ul style="list-style-type: none"> Check the air intake system for blockages and leaks and determine if it is operating correctly.
<ul style="list-style-type: none"> The fuel supply system is tested for operating pressure, pressure retention, and fuel flow rate, and the results are noted. 	<ul style="list-style-type: none"> Test the fuel supply system for operating pressure, pressure retention, and fuel flow rate, and record the results.
<ul style="list-style-type: none"> The exhaust emissions and engine speed are measured at normal operating temperature, and the results are noted. 	<ul style="list-style-type: none"> Measure the exhaust emissions and engine speed at normal operating temperature, and the record the results
<ul style="list-style-type: none"> The results of the above tests are noted and compared with the vehicle specification, and are analysed to locate and identify the cause of any fault. 	<ul style="list-style-type: none"> Record and compare the results of the above tests with the vehicle specification, and analyse to locate and identify the cause of any fault.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
1.2 Test and service the EFI fuel injectors.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Safe working practices are observed throughout the task. 	<ul style="list-style-type: none"> Observe safe working practices throughout the task.
<ul style="list-style-type: none"> Suitable tools and equipment are selected and used to enable tests and the service work to be carried out. 	<ul style="list-style-type: none"> Select and use suitable tools and equipment to enable tests and service work to be carried out.
<ul style="list-style-type: none"> The injectors are tested to determine which are unserviceable and the nature of any unserviceability. 	<ul style="list-style-type: none"> Test the injectors and determine which are unserviceable and the nature of unserviceability.

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The injectors are cleaned to restore normal operation by running the engine on a chemical cleaning fuel. 	<ul style="list-style-type: none"> Clean the injectors to restore normal operation by running the engine on a chemical cleaning fuel.
<ul style="list-style-type: none"> Reject injectors and injector seals are replaced with new ones that meet manufacturer's specifications. 	<ul style="list-style-type: none"> Replace reject injectors and injector seals with new ones that meet manufacturer's specification.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
1.3 Rectify EFI system faults on an engine.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Safe working practices are observed throughout the task. 	<ul style="list-style-type: none"> Observe safe working practices throughout the task.
<ul style="list-style-type: none"> Any faulty EFI system components are replaced with parts that meet manufacturer's specifications, and in a manner prescribed by the manufacturer. 	<ul style="list-style-type: none"> Replace any faulty EFI system components with parts that meet manufacturer's specifications, and in a manner prescribed by the manufacturer.
<ul style="list-style-type: none"> The system is tested to ensure the integrity of the wiring is maintained in a serviceable condition. 	<ul style="list-style-type: none"> Test the system to ensure that the integrity of the wiring is maintained in a serviceable condition.
<ul style="list-style-type: none"> The system is tested to ensure that there are no fuel blockages. 	<ul style="list-style-type: none"> Test the system to ensure there are no fuel blockages.
<ul style="list-style-type: none"> The system is tested to ensure that there are no air or fuel leaks. 	<ul style="list-style-type: none"> Test the system to ensure that there are no air or fuel leaks.
<ul style="list-style-type: none"> All adjustments are checked and where necessary, are corrected to comply with manufacturer's specifications. 	<ul style="list-style-type: none"> Check all adjustments and where necessary, correct to comply with manufacturer's specifications.
<ul style="list-style-type: none"> The EFI system operates and performs to manufacturer's specifications. 	<ul style="list-style-type: none"> Operate and perform the EFI system to manufacturer's specifications.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 2; Diagnose and repair faults in induction and exhaust systems

SUBJECT OUTCOME	
2.1 Check fuel system	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Fuel level and quality is checked and needed action is determined and record. <p><i>Range: Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, and supply and return lines and fittings; determine needed action.</i></p>	<ul style="list-style-type: none"> Check fuel level and quality; determine and record needed action. <p><i>Range: Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, and supply and return lines and fittings; determine needed action.</i></p>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
2.2 Inspect the fuel pump.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Fuel transfer (lift) pump, pump drives, screens, fuel /water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware are inspected, cleaned and tested. Needed action is determined and recorded. 	<ul style="list-style-type: none"> Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine and record needed action.
<ul style="list-style-type: none"> Low pressure regulator systems are tested and inspected (valves, pressure regulator valves, and restrictive fittings are checked). Needed action is determined and recorded. 	<ul style="list-style-type: none"> Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine and record needed action.
<ul style="list-style-type: none"> Fuel system is checked for air; fuel system is bled and primer pump is checked. Needed action is determined and recorded. 	<ul style="list-style-type: none"> Check fuel system for air; prime and bleed fuel system and check primer pump. Determine and record needed action.
<ul style="list-style-type: none"> Power, ground circuits and connections are tested and inspected. Needed action is determined and recorded. 	<ul style="list-style-type: none"> Inspect and test power and ground circuits and connections; determine and record needed action.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
2.3 Inspect and replace electronic system.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Relevant service information is located and used. <i>Range: Include diagnostic procedures, flow charts, and wiring diagrams.</i> 	<ul style="list-style-type: none"> Locate and use relevant service information. <i>Range: Include diagnostic procedures, flow charts, and wiring diagrams.</i>
<ul style="list-style-type: none"> Electrical connector terminals, seals and locks are inspected and replaced. 	<ul style="list-style-type: none"> Inspect and replace electrical connector terminals, seals, and locks.
<ul style="list-style-type: none"> Sensors, controls, actuator components and circuits are inspected and tested and adjusted or replaced as needed. 	<ul style="list-style-type: none"> Inspect and test sensors, controls, actuator components, and circuits; adjust or replace as needed.
<ul style="list-style-type: none"> Using recommended electronic diagnostic tools, access and change customer parameters. <i>Range: To include PC based software and/or data scan tools.</i> 	<ul style="list-style-type: none"> Access and change customer parameters, using recommended electronic diagnostic tools. <i>Range: To include PC based software and/or data scan tools.</i>
<ul style="list-style-type: none"> A cylinder contribution test is performed and the recommended electronic diagnostic tool is utilised. 	<ul style="list-style-type: none"> Perform a cylinder contribution test and utilise the recommended electronic diagnostic tool.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 3: Diagnose and repair hydraulic brake systems

SUBJECT OUTCOME	
3.1 Demonstrate diesel technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for a diesel repair facility.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The safe and correct application for chemicals used in a diesel repair facility is determined. 	<ul style="list-style-type: none"> Determine the safe and correct application for chemicals used in a diesel repair facility.
<ul style="list-style-type: none"> Protective clothing and safety equipment is used. 	<ul style="list-style-type: none"> Use protective clothing and safety equipment.
<ul style="list-style-type: none"> Fire protection equipment is used. 	<ul style="list-style-type: none"> Use fire protection equipment.
<ul style="list-style-type: none"> OSHA and EPA regulations affecting diesel service technology are followed. 	<ul style="list-style-type: none"> Follow OSHA and EPA regulations affecting diesel service technology.
<ul style="list-style-type: none"> Safety communications are responded to. 	<ul style="list-style-type: none"> Respond to safety communications.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
3.2 Apply fundamental science concepts to truck brake technology.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Physics concepts are examined and applied to brake technology. 	<ul style="list-style-type: none"> Examine how physics concepts apply to brake system operation
<ul style="list-style-type: none"> The application of fundamental laws of hydraulics to brake hydraulic systems is explored. 	<ul style="list-style-type: none"> Explore the application of fundamental laws of hydraulics to brake hydraulic systems.
<ul style="list-style-type: none"> The characteristics and properties of liquids as applied to brake fluid are analysed. 	<ul style="list-style-type: none"> Analyse the characteristics and properties of liquids as applied to brake fluid.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
3.3 Properly test, diagnose, and repair air brake air supply and service systems.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The function and operation of air supply and service systems are analysed. 	<ul style="list-style-type: none"> Analyse the function and operation of air supply and service systems.
<ul style="list-style-type: none"> The air supply and service systems and components are tested, diagnosed and repaired or replaced. 	<ul style="list-style-type: none"> Test, diagnose, and repair or replace air supply and service systems and components.
<ul style="list-style-type: none"> The effects of weight and speed on braking and stopping distance are examined and recorded. 	<ul style="list-style-type: none"> Examine and record the effects of weight and speed on braking and stopping distance.
<ul style="list-style-type: none"> Thermal expansion of fluids, gases and solids are researched and explained. 	<ul style="list-style-type: none"> Research and explain thermal expansion of fluids, gases, and solids.
<ul style="list-style-type: none"> The principles of thermodynamics are explained with respect to braking. 	<ul style="list-style-type: none"> Explain the principles of thermodynamics with respect to braking.
<ul style="list-style-type: none"> In consideration of Newton's laws of motion, the concepts of force, mass, and acceleration applicable to braking are determined. 	<ul style="list-style-type: none"> Determine which concepts of force, mass, and acceleration apply to braking, considering Newton's laws of motion.
<ul style="list-style-type: none"> The process in which motion converts to heat energy is illustrated. 	<ul style="list-style-type: none"> Illustrate how motion converts to heat energy.
<ul style="list-style-type: none"> The relationship between atmospheric pressure and the term vacuum is explained. 	<ul style="list-style-type: none"> Explain how atmospheric pressure relates to the term vacuum.
<ul style="list-style-type: none"> The characteristics of liquids are assessed and recorded. 	<ul style="list-style-type: none"> Assess and record the characteristics of liquids.
<ul style="list-style-type: none"> The properties of brake fluid are determined and explained. 	<ul style="list-style-type: none"> Determine and explain the properties of brake fluid.
<ul style="list-style-type: none"> The laws of hydraulics as applied to the brakes system is discussed and recorded. 	<ul style="list-style-type: none"> Discuss and record the laws of hydraulics as applied to brakes systems.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
3.4 Properly test, diagnose, and repair air brake mechanical/foundation brakes.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • The function and operation of air brake mechanical/foundational brakes are analysed and described. 	<ul style="list-style-type: none"> • Analyse and describe the function and operation of air brake mechanical/foundation brakes.
<ul style="list-style-type: none"> • Air brake mechanical/foundational brakes and components are tested, diagnosed and repaired or replaced. 	<ul style="list-style-type: none"> • Test, diagnose, and repair or replace air brake mechanical/foundation brakes and components.
<ul style="list-style-type: none"> • The air brake system requirements of the FMVSS (Federal Motor Vehicle Safety Standard) 121 requirements are examined and observed. 	<ul style="list-style-type: none"> • Examine and observe the air brake system requirements of the FMVSS (Federal Motor Vehicle Safety Standard) 121 requirements.
<ul style="list-style-type: none"> • The operation of the following is illustrated and needed action is determined. <i>Range: Air brake supply system, air brake system governor and compressor, air brake control system, check valves, malfunctions.</i> 	<ul style="list-style-type: none"> • Illustrate the operation of the following and determine needed action. <i>Range: Air brake supply system, air brake system governor and compressor, air brake control system, check valves, malfunctions.</i>
<ul style="list-style-type: none"> • Air system build-up time is checked and needed action is determined. 	<ul style="list-style-type: none"> • Check air system build-up time and determine needed action.
<ul style="list-style-type: none"> • Air reservoir tanks are drained and checked for oil, water, and foreign material, and needed action is determined. 	<ul style="list-style-type: none"> • Drain air reservoir tanks; check for oil, water, and foreign material and determine needed action.
<ul style="list-style-type: none"> • Compressor drive belts, pulleys, and tensioners; low pressure warning devices, and components that remove water from the air brake system are inspected, adjusted and aligned. 	<ul style="list-style-type: none"> • Inspect, adjust, and align compressor drive belts, pulleys, and tensioners; low pressure warning devices, and components that remove water from the air brake system.
<ul style="list-style-type: none"> • Poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply and service system are diagnosed and replaced where needed. 	<ul style="list-style-type: none"> • Diagnose and replace where needed poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply and service system.
<ul style="list-style-type: none"> • The following is inspected/tested and adjusted, repaired, or replaced as needed. <i>Range: Compressor drive gear and coupling; air compressor, air cleaner/supply, oil supply and coolant lines, fittings, and mounting brackets; systems pressure controls: governor, unloaded assembly valves, intake screens, filters, lines, hoses, and fittings., air system lines, hoses, fittings, and couplings; air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; air drier systems, filters, valves, heaters, wiring, and connectors; brake application (foot) valve, fittings, and mount; stop light circuit switches, wiring, and connectors; hand brake (trailer) control valve, lines, fittings, and mountings; brake relay valve.; quick release valves; front and rear axle limiting (proportioning) valves; tractor protection valve.</i> 	<ul style="list-style-type: none"> • Inspect/test the following and adjust, repair, or replace as needed. <i>Range: Compressor drive gear and coupling; air compressor, air cleaner/supply, oil supply and coolant lines, fittings, and mounting brackets; systems pressure controls: governor, unloader assembly valves, intake screens, filters, lines, hoses, and fittings; air system lines, hoses, fittings, and couplings; air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; air drier systems, filters, valves, heaters, wiring, and connectors; brake application (foot) valve, fittings, and mount; stop light circuit switches, wiring, and connectors; hand brake (trailer) control valve, lines, fittings, and mountings; brake relay valve.; quick release valves; front and rear axle limiting (proportioning) valves; tractor protection valve.</i>

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The following is illustrated and recorded: <i>Range: Air brake mechanical/foundation brakes and components; S-Cam type foundation brake assemblies; Wedge type foundation brake assemblies, including their self-adjusting mechanisms.</i> 	<ul style="list-style-type: none"> Illustrate and record the operation of the following: <i>Range: Air brake mechanical/foundation brakes and components; S-Cam type foundation brake assemblies; Wedge type foundation brake assemblies, including their self-adjusting mechanisms.</i>
<ul style="list-style-type: none"> The design and operation of the different types of automatic slack adjusters are compared and explained. 	<ul style="list-style-type: none"> Compare and explain the design and operation of the different types of automatic slack adjusters.
<ul style="list-style-type: none"> Needed action for poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by foundation brake, slack adjuster and brake chamber problems are diagnosed and determined. 	<ul style="list-style-type: none"> Diagnose and determine needed action for poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems.
<ul style="list-style-type: none"> The following is inspected, tested, repaired or replaced as needed: <i>Range: Service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; Camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor spins, and springs; Wedge brake spider, manual and automatic adjuster plungers, housing, and wedge assembly.</i> 	<ul style="list-style-type: none"> Inspect, test, repair or replace the following as needed: <i>Range: Service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; Camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor spins, and springs; Wedge brake spider, manual and automatic adjuster plungers, housing, and wedge assembly.</i>
<ul style="list-style-type: none"> Manual and automatic slack adjusters are inspected; serviced and needed action is performed. 	<ul style="list-style-type: none"> Inspect, service and perform needed action for manual and automatic slack adjusters.
<ul style="list-style-type: none"> Air disk calliper assemblies are inspected, cleaned, adjusted and needed repairs are determined. 	<ul style="list-style-type: none"> Inspect, clean, adjust and determine needed repairs for air disc brake calliper assemblies.
<ul style="list-style-type: none"> The following is inspected, measured and required action is performed. <i>Range: Brake shoes; linings; pads; drums; rotors.</i> 	<ul style="list-style-type: none"> Inspect, measure and perform needed action on the following : <i>Range: Brake shoes; linings; pads; drums; rotors.</i>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 4: Diagnose and repair cooling systems

SUBJECT OUTCOME	
4.1 Check and test engine coolant.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Engine coolant level, condition and consumption are checked and needed action is determined. 	<ul style="list-style-type: none"> Check engine coolant level, condition, and consumption; determine needed action.
<ul style="list-style-type: none"> Cooling system is bled and recovered, flushed and filled with recommended coolant/additive package. 	<ul style="list-style-type: none"> Bleed cooling system and recover, flush, and refill with recommended coolant/additive package.
<ul style="list-style-type: none"> Coolant is tested and adjusted for freeze protection and additive package concentration as needed. 	<ul style="list-style-type: none"> Test and adjust coolant for freeze protection and additive package concentration.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
4.2 Adjusting of belt.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Drive belts, tensioners and pulleys are inspected, replaced and adjusted as needed. 	<ul style="list-style-type: none"> • Inspect, replace and adjust drive belts, tensioners, and pulleys.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

SUBJECT OUTCOME	
4.3 Inspecting of engine component coolant.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Coolant conditioner/filter assembly are inspected for leaks; valves, lines, and fittings and replaced where needed. 	<ul style="list-style-type: none"> • Inspect and replace coolant conditioner/filter assembly for leaks; valves, lines, and fittings.
<ul style="list-style-type: none"> • Water pump and hoses are inspected and replaced where needed. 	<ul style="list-style-type: none"> • Inspect and replace water pump and hoses as needed.
<ul style="list-style-type: none"> • The radiator, pressure cap, tank(s), and recovery systems are inspected, cleaned and pressure tested. Needed action is determined. 	<ul style="list-style-type: none"> • Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

Topic 5: Repair manual transmissions

SUBJECT OUTCOME	
5.1 Manual transmission types and applications	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Clutch system components and their operation are identified and described 	<ul style="list-style-type: none"> Identify and describe clutch system components and their operation.
<ul style="list-style-type: none"> Clutches are serviced, replaced and adjusted. 	<ul style="list-style-type: none"> Service, replace and adjust clutches.
<ul style="list-style-type: none"> Manual transmission components are identified and their operation described. 	<ul style="list-style-type: none"> Identify manual transmission components and describe their operation.
<ul style="list-style-type: none"> Manual transmission power flow is traced. 	<ul style="list-style-type: none"> Trace manual transmission power flow.
<ul style="list-style-type: none"> Manual transmission is serviced, adjusted and repaired. 	<ul style="list-style-type: none"> Service, adjust and repair manual transmissions.
<ul style="list-style-type: none"> Automotive problems are solved in a systematic, logical and efficient manner. 	<ul style="list-style-type: none"> Solve automotive problems in a systematic, logical, and efficient manner.
<ul style="list-style-type: none"> Simple and complex electrical problems are diagnosed and repaired. 	<ul style="list-style-type: none"> Diagnose and repair simple and complex electrical problems.
<ul style="list-style-type: none"> Engine mechanical problems are diagnosed and repaired. 	<ul style="list-style-type: none"> Diagnose and repair engine mechanical problems.
<ul style="list-style-type: none"> Automatic transmission and transaxles are diagnosed and repaired, including total rebuilding of units. 	<ul style="list-style-type: none"> Diagnose and repair automatic transmissions and transaxles, including total rebuilding of units.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
5.2 Service gears, shafts and synchronizing.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Safety devices are identified. 	<ul style="list-style-type: none"> Identify safety devices.
<ul style="list-style-type: none"> Drive shaft and universal components are identified and their operation is described. 	<ul style="list-style-type: none"> Identify drive shaft and universal components and describe their operation.
<ul style="list-style-type: none"> The drive shaft, CV and universal type joints are serviced and repaired. 	<ul style="list-style-type: none"> Service and repair drive shaft, CV, and universal type joints.
<ul style="list-style-type: none"> Rear axle components are identified and their operation is described. 	<ul style="list-style-type: none"> Identify rear axle components and describe their operation.
<ul style="list-style-type: none"> Rear axles are serviced, adjusted and repaired. 	<ul style="list-style-type: none"> Service, adjust and repair rear axles.
<ul style="list-style-type: none"> Manual transmissions and transaxles, as well as other driveline components such as drive-shafts, drive axles and differentials are diagnosed and repaired. 	<ul style="list-style-type: none"> Diagnose and repair manual transmissions and transaxles, as well as other driveline components such as drive-shafts, drive axles, and differentials.
<ul style="list-style-type: none"> Engine and other automotive parts are measured, using the appropriate measuring instruments. 	<ul style="list-style-type: none"> Measure engine and other automotive parts, using the appropriate measuring instruments.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
5.3 Overhaul, repair and adjust manual transmissions.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Transaxle components are identified and their operation is described. 	<ul style="list-style-type: none"> • Identify transaxle components and describe their operation.
<ul style="list-style-type: none"> • Transaxles are serviced, adjusted and repaired. 	<ul style="list-style-type: none"> • Service, adjust, and repair transaxles.
<ul style="list-style-type: none"> • Clutch, transmission, drives line and rear axle problems are diagnosed. 	<ul style="list-style-type: none"> • Diagnose clutch, transmission, drive line and rear axle problems.
<ul style="list-style-type: none"> • Machining and repair of drive line components is understood. 	<ul style="list-style-type: none"> • Understand machining and repair of drive line components.
<ul style="list-style-type: none"> • Steering and suspension problems are diagnosed and repaired and the suspension of all types of automobiles and light trucks is properly aligned, using either two- or four-wheel alignment machines. 	<ul style="list-style-type: none"> • Diagnose and repair steering and suspension problems and properly align the suspension of all types of automobiles and light trucks, using either two- or four-wheel alignment machines.
<ul style="list-style-type: none"> • Automotive air-conditioning systems are diagnosed and repaired. 	<ul style="list-style-type: none"> • Diagnose and repair automotive air-conditioning systems.
<ul style="list-style-type: none"> • An understanding is demonstrated of basic principles needed for the understanding of new technologies as they become incorporated into automotive designs. 	<ul style="list-style-type: none"> • Demonstrate an understanding of basic principles needed for understanding of new technologies as they become incorporated into automobile designs.
<ul style="list-style-type: none"> • Repair estimates are made and the necessary paperwork for customer service and warranty repairs is completed. 	<ul style="list-style-type: none"> • Make repair estimates and complete the necessary paperwork for customer service and warranty repairs.
<ul style="list-style-type: none"> • Basic business practices are applied, including the cultivation of good customer and employee relations. 	<ul style="list-style-type: none"> • Apply basic business practices, including cultivation of good customer and employee relations.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

Topic 6: Repair suspension systems

SUBJECT OUTCOME	
6.1 Diagnose and repair various front suspension system problems using a strategy-based process.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Root cause for front suspension problems related to the following are determined: <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i> 	<ul style="list-style-type: none"> Determine root cause for front suspension problems related to the following: <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i>
<ul style="list-style-type: none"> Needed repairs to front system problems are performed, related to the following: <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i> 	<ul style="list-style-type: none"> Perform needed repairs to solve front system problems related to the following: <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
6.2 Diagnose and repair various rear suspension system problems using a strategy-based process.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The root causes for the following problems are diagnosed and determined: <i>Range: Steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i> 	<ul style="list-style-type: none"> Diagnose and determine root causes for the following: <i>Range: Steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i>
<ul style="list-style-type: none"> Front systems problems related to the following are repaired. <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i> 	<ul style="list-style-type: none"> Repair front system problems related to: <i>Range: Ride height, body sway, McPherson strut, SLA components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.</i>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
6.3 Diagnose wheel alignment problems and perform needed adjustments or repair.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The root cause of alignment problems related to vehicle stability and handling, tyre wear, and steering wheel location is determined. 	<ul style="list-style-type: none"> Determine root cause of alignment problems related to vehicle stability and handling, tyre wear, and steering wheel location.
<ul style="list-style-type: none"> Pre-alignment inspection procedures are performed according to MFG recommendations. 	<ul style="list-style-type: none"> Perform pre-alignment inspection procedures according to MFG recommendations.
<ul style="list-style-type: none"> Two- or four-wheel alignment is performed and front and rear wheels are adjusted as needed. 	<ul style="list-style-type: none"> Perform two and four wheel alignment inspection and adjust front and rear wheel as needed.
<ul style="list-style-type: none"> Front cradle alignment procedure is performed. 	<ul style="list-style-type: none"> Perform front cradle alignment procedure.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
6.4 Diagnose and repair various wheel and tyre problems.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The root cause of unusual tyre problems related to wear patterns, vibration, shimmy, noise and vehicle pull is determined. 	<ul style="list-style-type: none"> Determine root cause of unusual tyre problems related to wear patterns, vibration, shimmy, noise and vehicle pull.
<ul style="list-style-type: none"> Needed repairs are performed to solve tyre related problems. 	<ul style="list-style-type: none"> Perform needed repairs to solve tyre related problems.
<ul style="list-style-type: none"> Proper preventative service is performed on tyre and wheel components. 	<ul style="list-style-type: none"> Perform proper preventative service on tyre and wheel components.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 7: Diagnose and repair steering systems components

SUBJECT OUTCOME	
7.1 Apply proper safety procedures and processes.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Shop environment is explained and hazards are described. 	<ul style="list-style-type: none"> Explain shop environment and describe hazards.
<ul style="list-style-type: none"> Emergency procedures and policies are observed and described. 	<ul style="list-style-type: none"> Observe and describe emergency procedures and policy.
<ul style="list-style-type: none"> Responsibility for personal well being is accepted and safety guidelines are followed and practised. 	<ul style="list-style-type: none"> Accept responsibility for personal well being and practice and follow safety guidelines.
<ul style="list-style-type: none"> Material safety data sheets and chemicals used in shop are observed and explained. 	<ul style="list-style-type: none"> Observe and explain material safety data sheets and chemicals used in shop.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
7.2 Diagnose and repair various steering system problems using a strategy-based process.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Root cause for the following problems are determined: <i>Range: Steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i> 	<ul style="list-style-type: none"> • Determine root cause for the following problems: <i>Range: Steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i>
<ul style="list-style-type: none"> • Needed repairs to solve the following problems are performed: <i>Range: Steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i> 	<ul style="list-style-type: none"> • Perform needed repairs to the following: <i>Range: Solve steering system problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.</i>
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

Topic 8: Service and repair automobile electronic ignition systems.

SUBJECT OUTCOME	
8.1 Diagnose, service and maintain automobile air conditioning systems.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • The basic operating principles of the refrigeration cycle and the function of air-conditioning components of an automobile air-conditioning system is discussed and explained. 	<ul style="list-style-type: none"> • Discuss and explain the basic operating principles of the refrigeration cycle and the function of air-conditioning components of an automobile air-conditioning system.
<ul style="list-style-type: none"> • Air-conditioning electrical circuit diagrams and component symbols are read and interpreted. 	<ul style="list-style-type: none"> • Read and interpret air-conditioning electrical circuit diagrams and component symbols.
<ul style="list-style-type: none"> • Automobile air-conditioning systems are maintained. 	<ul style="list-style-type: none"> • Maintain automobile air-conditioning systems.
<ul style="list-style-type: none"> • An automobile air-conditioning system is serviced. 	<ul style="list-style-type: none"> • Service an automobile air-conditioning system.
<ul style="list-style-type: none"> • Automobile air conditioner components are removed and fitted. 	<ul style="list-style-type: none"> • Remove and fit automobile air conditioner components.
<ul style="list-style-type: none"> • Automobile air conditioning problems are diagnosed. 	<ul style="list-style-type: none"> • Diagnose automobile air conditioning problems.
<ul style="list-style-type: none"> • Relevant safety practices and procedures are applied or adhered to when working with air conditioning systems. 	<ul style="list-style-type: none"> • Apply relevant safety practices and procedures when working with air conditioning systems.
<ul style="list-style-type: none"> • Incidents and problems related to automobile air conditioning systems are discussed and reported and fault finding reports and requisition forms are compiled. 	<ul style="list-style-type: none"> • Discuss and report incidents and problems related to automobile air conditioning systems and compile fault finding reports and requisition forms.
<ul style="list-style-type: none"> • Appropriate tools, test equipment and components are identified and selected. 	<ul style="list-style-type: none"> • Identify and select appropriate tools, test equipment and components.

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> All testing and repair work is done in a safe manner without causing any damage. 	<ul style="list-style-type: none"> Test and repair without causing any damage and in a safe manner.
<ul style="list-style-type: none"> Air conditioning system is checked in accordance to manufacturer's specifications. 	<ul style="list-style-type: none"> Check to see if air conditioning system is operating according to manufacturer's specifications
<ul style="list-style-type: none"> Air conditioning system is serviced according to manufacturer's specifications. 	<ul style="list-style-type: none"> Service air conditioning system according to manufacturer's specifications.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
8.2 Construct and test advanced electronic circuits.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The fundamentals of advanced electronics are discussed and explained. 	<ul style="list-style-type: none"> Discuss and explain the fundamentals of advanced electronics.
<ul style="list-style-type: none"> The operation of advanced electronic circuits are discussed and explained. 	<ul style="list-style-type: none"> Discuss and explain the operation of advanced electronic circuits.
<ul style="list-style-type: none"> Advanced electronic circuit diagrams are read and interpreted. 	<ul style="list-style-type: none"> Read and interpret advanced electronic circuit diagrams.
<ul style="list-style-type: none"> Advanced electronic and related components for circuit construction are identified and selected. 	<ul style="list-style-type: none"> Identify and select advanced electronic and related components for circuit construction.
<ul style="list-style-type: none"> Advanced electronic circuits are tested for static and dynamic voltages. 	<ul style="list-style-type: none"> Test advanced electronic circuits for static and dynamic voltages.
<ul style="list-style-type: none"> Advanced electronic circuits are constructed 	<ul style="list-style-type: none"> Construct advanced electronic circuits.
<ul style="list-style-type: none"> Relevant safety procedures are applied when working with electronic equipment. 	<ul style="list-style-type: none"> Apply the relevant safety procedures when working with electronic equipment.
<ul style="list-style-type: none"> Incidents and problems related to advanced electronic work are discussed and reported and fault finding reports and requisition forms are compiled. 	<ul style="list-style-type: none"> Discuss and report incidents and problems related to advanced electronic work and compile fault finding reports and requisition forms.
<ul style="list-style-type: none"> Appropriate tools, personal and automobile protective equipment are correctly selected and used. 	<ul style="list-style-type: none"> Select and use appropriate tools, personal and automobile protective equipment correctly.
<ul style="list-style-type: none"> Appropriate hand tools and test equipment are identified and used correctly. 	<ul style="list-style-type: none"> Identify and use appropriate hand tools and test equipment correctly.
<ul style="list-style-type: none"> Faults are located and repaired. 	<ul style="list-style-type: none"> Locate and repair faults.
<ul style="list-style-type: none"> Circuit is operated according to manufacturer's specifications. 	<ul style="list-style-type: none"> Operate circuit according to manufacturer's specifications.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
8.3 Trace and repair faults on advanced auto-electrical circuits.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Automobile electric circuit diagrams and symbols are read, discussed and interpreted. 	<ul style="list-style-type: none"> Read, discuss and interpret automobile electric circuit diagrams and symbols.
<ul style="list-style-type: none"> Test equipment is selected and used to locate faults on auto electric circuits following prescribed fault finding techniques using manuals and circuit diagrams. 	<ul style="list-style-type: none"> Select and use test equipment to locate faults on auto electric circuits following prescribed fault finding techniques using manuals and circuit diagrams.
<ul style="list-style-type: none"> Faulty auto electrical components are removed and new components refitted from/to an automobile. 	<ul style="list-style-type: none"> Remove faulty and refit new auto electrical components from/to an automobile.
<ul style="list-style-type: none"> Fault reports and requisition forms are completed. 	<ul style="list-style-type: none"> Complete fault reports and requisition forms.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
8.4 Diagnose, test and repair electronic automobile fuel injection systems.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The operation of an electronic fuel injection system is discussed and explained. 	<ul style="list-style-type: none"> Discuss and explain the operation of an electronic fuel injection system.
<ul style="list-style-type: none"> Block diagrams of an electronic fuel injection system are read and interpreted. 	<ul style="list-style-type: none"> Read and interpret block diagrams of an electronic fuel injection system.
<ul style="list-style-type: none"> Electronic fuel injection system and sub-system components are identified and selected. 	<ul style="list-style-type: none"> Identify and select electronic fuel injection system and sub-system components.
<ul style="list-style-type: none"> Faults on an electronic fuel injection system are located. 	<ul style="list-style-type: none"> Locate faults on an electronic fuel injection system
<ul style="list-style-type: none"> Electronic fuel injection systems are serviced. 	<ul style="list-style-type: none"> Service electronic fuel injection systems
<ul style="list-style-type: none"> Relevant system safety and servicing precautions are applied when working with electronic fuel injector systems. 	<ul style="list-style-type: none"> Apply the relevant system safety and servicing precautions when working with electronic fuel injector systems.
<ul style="list-style-type: none"> Incidents and problems related to electronic fuel injector systems are discussed and reported and fault finding reports and requisitions are completed. 	<ul style="list-style-type: none"> Discuss and report incidents and problems related electronic fuel injector systems and complete fault finding reports and requisitions.
<ul style="list-style-type: none"> Tools, test equipment and components are correctly selected and used. 	<ul style="list-style-type: none"> Select and use tools, test equipment and components are correctly.
<ul style="list-style-type: none"> Electronic ignition system components are correctly removed and fitted. 	<ul style="list-style-type: none"> Remove and fit electronic ignition system components are correctly.
<ul style="list-style-type: none"> Automobile electronic ignition system is tested and repaired and functioning to manufacturers' specifications. 	<ul style="list-style-type: none"> Test and repair automobile electronic ignition system according to manufacturers' specifications.
<ul style="list-style-type: none"> Electronic ignition system faults are correctly diagnosed. 	<ul style="list-style-type: none"> Diagnose electronic ignition system faults are correctly.
<ul style="list-style-type: none"> Relevant documentation is used and completed correctly. 	<ul style="list-style-type: none"> Complete relevant documentation is used and correctly.
<ul style="list-style-type: none"> Work practices are adhered to in a safe manner. 	<ul style="list-style-type: none"> Adhere to working practices in a safe manner.

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Questions are responded to and issues related to automobile electronic ignition systems are discussed. 	<ul style="list-style-type: none"> • Respond to questions and discuss issues related to automobile electronic ignition systems.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

SUBJECT OUTCOME	
8.5 Fit and wire up auxiliary auto-electrical equipment	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • The operation of auxiliary auto-electrical equipment and related harnesses fitted to an automobile is discussed and explained. 	<ul style="list-style-type: none"> • Discuss and explain the operation of auxiliary auto-electrical equipment and related harnesses fitted to an automobile.
<ul style="list-style-type: none"> • Fitting and wiring of auxiliary auto-electrical equipment is planned and prepared. 	<ul style="list-style-type: none"> • Plan and prepare for fitting and wiring of auxiliary auto-electrical equipment.
<ul style="list-style-type: none"> • Auxiliary auto-electrical equipment is fitted and rewired. 	<ul style="list-style-type: none"> • Fit and wire auxiliary auto-electrical equipment.
<ul style="list-style-type: none"> • Fitted auxiliary auto-electrical equipment is commissioned and tested. 	<ul style="list-style-type: none"> • Commission and test fitted auxiliary auto-electrical equipment.
<ul style="list-style-type: none"> • Necessary documentation and reports are completed. 	<ul style="list-style-type: none"> • Complete necessary documentation and reports.
<ul style="list-style-type: none"> • Relevant safety practices are applied when fitting and wiring auxiliary auto-electrical equipment. 	<ul style="list-style-type: none"> • Apply relevant safety practices when fitting and wiring auxiliary auto-electrical equipment.
<ul style="list-style-type: none"> • Tools, test equipment and components are correctly selected and used. 	<ul style="list-style-type: none"> • Select and use tools, test equipment and components correctly.
<ul style="list-style-type: none"> • Electronic fuel injection system components are correctly removed, checked and refitted. 	<ul style="list-style-type: none"> • Remove, check and refit electronic fuel injection system components.
<ul style="list-style-type: none"> • Automobile electronic fuel injection system is tested and repaired and functioning to specifications. 	<ul style="list-style-type: none"> • Test and repair automobile electronic fuel injection system according to manufacturer's specifications.
<ul style="list-style-type: none"> • Electronic fuel injection system faults are correctly diagnosed. 	<ul style="list-style-type: none"> • Diagnose electronic fuel injection system faults correctly.
<ul style="list-style-type: none"> • Relevant documentation is used and completed correctly. 	<ul style="list-style-type: none"> • Use and complete relevant documentation correctly.
<ul style="list-style-type: none"> • Safe working practices are adhered to. 	<ul style="list-style-type: none"> • Adhere to safe working practices.
<ul style="list-style-type: none"> • Questions are responded to and issues related to automobile electronic fuel injection systems are discussed. 	<ul style="list-style-type: none"> • Respond to questions and discuss issues related to automobile electronic fuel injection systems.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

SUBJECT OUTCOME	
8.6 Service and repair electronic automobile ignition systems.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Automobile electronic ignition system circuit diagrams and symbols are read and interpreted. 	<ul style="list-style-type: none"> Read and interpret automobile electronic ignition system circuit diagrams and symbols.
<ul style="list-style-type: none"> Various components used in automobile electronic ignition systems are selected, explained and discussed. 	<ul style="list-style-type: none"> Select, explain and discuss various components used in automobile electronic ignition systems.
<ul style="list-style-type: none"> Ignition system components are removed and refitted from/to an automobile using the correct tools in a safe and aware manner according to procedures. 	<ul style="list-style-type: none"> Remove and fit ignition system components from/to an automobile using the correct tools in a safe and aware manner according to procedures.
<ul style="list-style-type: none"> Electronic ignition system and components are serviced and tested. 	<ul style="list-style-type: none"> Service and test electronic ignition system and components.
<ul style="list-style-type: none"> Electronic ignition system problems are diagnosed. 	<ul style="list-style-type: none"> Diagnose electronic ignition system problems.
<ul style="list-style-type: none"> Fault reports and requisition forms are completed. 	<ul style="list-style-type: none"> Complete fault reports and requisition forms.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 9: Repair vehicle differentials

SUBJECT OUTCOME	
9.1 Identify and select correct tools and equipment.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Appropriate tools and equipment are used and cared for. 	<ul style="list-style-type: none"> Use and care for appropriate tools and equipment.
<ul style="list-style-type: none"> The method to recondition differentials is explained. 	<ul style="list-style-type: none"> Explain the method to recondition differentials.
<ul style="list-style-type: none"> Measuring instruments related to differential reconditioning are used and cared for. 	<ul style="list-style-type: none"> Use and care for measuring instruments related to differential reconditioning.
<ul style="list-style-type: none"> Procedures to test and check differentials prior to dismantling and after reconditioning are observed and explained. 	<ul style="list-style-type: none"> Observe and explain procedures to test and check differentials prior to dismantling and after reconditioning.
<ul style="list-style-type: none"> Job instructions are read, interpreted and a sequence of operations is determined according to work site procedures. 	<ul style="list-style-type: none"> Read and interpret job instructions and determine a sequence of operations according to work site procedures.
<ul style="list-style-type: none"> Appropriate tools and equipment are identified and selected according to job requirements and work site procedures. 	<ul style="list-style-type: none"> Identify and select appropriate tools and equipment and select according to job requirements and work site procedures.
<ul style="list-style-type: none"> Manufacturer's manuals and/or specifications are acquired according to job requirements. 	<ul style="list-style-type: none"> Acquire manufacturer's manuals and/or specifications according to job requirements.
<ul style="list-style-type: none"> Appropriate personal protective equipment (PPE) is identified and selected according to statutory requirements. 	<ul style="list-style-type: none"> Identify and select appropriate personal protective equipment (PPO) according to statutory requirements.
<ul style="list-style-type: none"> Work area and differential is prepared according to safety, work site and manufacturer's procedures. 	<ul style="list-style-type: none"> Prepare work area and differential according to safety, work site and manufacturer's procedures.
<ul style="list-style-type: none"> Reasons for selecting appropriate tools, equipment and PPE are given. 	<ul style="list-style-type: none"> Give reasons for selecting appropriate tools, equipment and PPE.

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Reason(s) for preparing work area and differential are given. 	<ul style="list-style-type: none"> Give reasons for preparing work area and differential.
<ul style="list-style-type: none"> The purpose of acquiring appropriate documentation and manuals is explained. 	<ul style="list-style-type: none"> Explain the purpose of acquiring documentation and manuals.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
9.2 Assess differential.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> The operation of a differential is discussed. 	<ul style="list-style-type: none"> Discuss the operation of a differential.
<ul style="list-style-type: none"> The functions of differential parts are identified, named and explained. 	<ul style="list-style-type: none"> Identify, name and explain the functions of differential parts.
<ul style="list-style-type: none"> Ferrous and non-ferrous metals related to differentials. 	<ul style="list-style-type: none"> Identify ferrous and non-ferrous metals related to differentials.
<ul style="list-style-type: none"> The methods of assessing serviceability of differential parts are explained. 	<ul style="list-style-type: none"> Explain the methods of assessing serviceability of differential parts.
<ul style="list-style-type: none"> Parts are cleaned before assessment, according to manufacturer's, work site and safety procedures. 	<ul style="list-style-type: none"> Clean parts, before assessment, according to manufacturer's, work site and safety procedures.
<ul style="list-style-type: none"> Parts are visually inspected for defects according to manufacturer's guidelines. 	<ul style="list-style-type: none"> Inspect parts visually for defects according to manufacturer's guidelines.
<ul style="list-style-type: none"> Parts are measured according to manufacturer's procedures. 	<ul style="list-style-type: none"> Measure parts according to manufacturer's procedures.
<ul style="list-style-type: none"> Measuring equipment is used according to manufacturer's procedures and job requirements. 	<ul style="list-style-type: none"> Use measuring equipment according to manufacturer's procedures and job requirements.
<ul style="list-style-type: none"> Measurements are recorded according to work site procedures. 	<ul style="list-style-type: none"> Record measurements according to work site procedures.
<ul style="list-style-type: none"> Measurements are compared to manufacturers' specifications for serviceability. 	<ul style="list-style-type: none"> Compare measurements to manufacturer's specifications for serviceability.
<ul style="list-style-type: none"> Unserviceable parts are separated and marked according to work site and quality procedures. 	<ul style="list-style-type: none"> Separate and mark unserviceable parts according to work site and quality procedures.
<ul style="list-style-type: none"> Replacement parts are ordered according to work site procedures. 	<ul style="list-style-type: none"> Order replacement parts according to work site procedures.
<ul style="list-style-type: none"> Appropriate tools and equipment is used according to safety and manufacturers procedures and job requirements. 	<ul style="list-style-type: none"> Use appropriate tools and equipment according to safety and manufacturers procedures and job requirements.
<ul style="list-style-type: none"> Parts are sorted according to ferrous and non-ferrous metal. 	<ul style="list-style-type: none"> Sort parts according to ferrous and non-ferrous metal.
<ul style="list-style-type: none"> Reasons for sorting ferrous and non-ferrous parts are given. 	<ul style="list-style-type: none"> Give reasons for sorting ferrous and non-ferrous parts.
<ul style="list-style-type: none"> The procedures to order replacement parts are discussed. 	<ul style="list-style-type: none"> Discuss the procedures to order replacement parts.
<ul style="list-style-type: none"> Reason(s) for parts been serviceable are given. 	<ul style="list-style-type: none"> Give reason(s) for parts been unserviceable.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
9.3 Assemble differential	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Procedures to obtain relevant service information are explained. 	<ul style="list-style-type: none"> • Explain procedures to obtain relevant service information.
<ul style="list-style-type: none"> • The principles of lubricants related to differentials are discussed. 	<ul style="list-style-type: none"> • Discuss the principles of lubricants related to differentials.
<ul style="list-style-type: none"> • Safety procedures related to reconditioning differentials discussed. 	<ul style="list-style-type: none"> • Discuss safety procedures related to reconditioning differentials. Clean parts before assembly according to safety and work site procedures.
<ul style="list-style-type: none"> • Parts are cleaned before assembly and workplace procedures. 	<ul style="list-style-type: none"> • Assemble differential according to manufacturer's procedures and specifications.
<ul style="list-style-type: none"> • Attachment agents are applied according to manufacturer's procedures and job requirements 	<ul style="list-style-type: none"> • Apply attachment agents according to manufacturer's procedures and job requirements.
<ul style="list-style-type: none"> • Specified lubricants are used during assembly 	<ul style="list-style-type: none"> • Use specified lubricants during assembly.
<ul style="list-style-type: none"> • Measurements and/or adjustments are performed during assembly according to manufacturer's procedures and specifications 	<ul style="list-style-type: none"> • Perform measurements and/or adjustments during assembly according to manufacturer's procedures and specifications.
<ul style="list-style-type: none"> • Post checks are demonstrated where necessary or possible, on completion of the reconditioning procedures according to manufacturers and work site procedures. 	<ul style="list-style-type: none"> • Demonstrate post checks, where necessary or possible, on completion of the reconditioning procedures according to manufacturers and work site procedures.
<ul style="list-style-type: none"> • Differential is reconditioned according to manufacturers or work site time schedules 	<ul style="list-style-type: none"> • Recondition differential according to manufacturers or work site time schedules.
<ul style="list-style-type: none"> • Reason(s) are given for using lubricants and cleaning parts before and during assembly 	<ul style="list-style-type: none"> • Give reason(s) for using lubricants and cleaning parts before and during assembly.
<ul style="list-style-type: none"> • Reason(s) are given for measurements and adjustments during assembly 	<ul style="list-style-type: none"> • Give reason(s) for measurements and adjustments during assembly.
<ul style="list-style-type: none"> • Reason(s) are given for post-test/checks 	<ul style="list-style-type: none"> • Give reason(s) for post-test/checks.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

SUBJECT OUTCOME	
9.4 Complete documentation and report on condition.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Attachment agents applicable to the task are selected and used. 	<ul style="list-style-type: none"> Select and use attachment agents applicable to the task.
<ul style="list-style-type: none"> Procedures for differentials prior to dismantling and after reconditioning are tested and checked. 	<ul style="list-style-type: none"> Test / check procedures for differentials prior to dismantling and after reconditioning
<ul style="list-style-type: none"> Differential is prepared for storage according to manufacturers' and site procedures. 	<ul style="list-style-type: none"> Prepare differential for storage according to manufacturer's and work site procedures.
<ul style="list-style-type: none"> Documentation is completed in accordance to work site procedures. 	<ul style="list-style-type: none"> Complete documentation according to work site procedures.
<ul style="list-style-type: none"> Work area is restored to a serviceable condition according to work site procedures. 	<ul style="list-style-type: none"> Restore work area to serviceable condition according to work site procedures.
<ul style="list-style-type: none"> Reason(s) for preparing vehicle differentials sub-assembly for storage are discussed. 	<ul style="list-style-type: none"> Discuss reason(s) for preparing vehicle differentials sub-assembly for storage.
<ul style="list-style-type: none"> Purpose of documentation is explained. 	<ul style="list-style-type: none"> Explain purpose of documentation
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

Topic 10: Recondition vehicle sub assembly

SUBJECT OUTCOME	
10.1 Identify and select correct tools and equipment	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Appropriate tools and equipment are used and cared for. 	<ul style="list-style-type: none"> Use and care for appropriate tools and equipment.
<ul style="list-style-type: none"> The method to recondition subassembly is explained. 	<ul style="list-style-type: none"> Explain the method to recondition sub-assembly
<ul style="list-style-type: none"> Measuring instruments related to subassembly reconditioning are used and cared for. 	<ul style="list-style-type: none"> Use and care for measuring instruments related to sub-assembly reconditioning.
<ul style="list-style-type: none"> Job instructions are read and interpreted and a sequence of operations are determined according to work site procedures 	<ul style="list-style-type: none"> Read and interpret job instructions and determine a sequence of operations according to work site procedures.
<ul style="list-style-type: none"> Appropriate tools and equipment are identified and selected according to job requirements and work site procedures 	<ul style="list-style-type: none"> Identify and select appropriate tools and equipment according to job requirements and work site procedures
<ul style="list-style-type: none"> Manufacturer's manuals and/or specifications are acquired according to job requirements. 	<ul style="list-style-type: none"> Acquire manufacturer's manuals and/or specifications according to job requirements.
<ul style="list-style-type: none"> Appropriate personal protective equipment (PPE) is identified and selected according to statutory requirements. 	<ul style="list-style-type: none"> Identify and select appropriate personal protective equipment (PPE) according to statutory requirements.
<ul style="list-style-type: none"> Work area and sub-assembly is prepared according to safety, work site and manufacturer's procedures. 	<ul style="list-style-type: none"> Prepare work area and sub-assembly is according to safety, work site and manufacturer's procedures.
<ul style="list-style-type: none"> Reason(s) for selecting appropriate tools and equipment are given. 	<ul style="list-style-type: none"> Give reason(s) for selecting appropriate tools and equipment

ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> Reason(s) for selecting appropriate PPE are explained. 	<ul style="list-style-type: none"> Explain reason(s) for selecting appropriate PPE.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> Observations. Class tests. Demonstrations. Practical tests. Interviews. Assignment/tasks. 	

SUBJECT OUTCOME	
10.2 Assess sub-assembly parts	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> An internal combustion engine is operated. 	<ul style="list-style-type: none"> Operate an internal combustion engine.
<ul style="list-style-type: none"> The functions of sub-assembly parts are identified and named. 	<ul style="list-style-type: none"> Identify, name and describe the functions of sub-assembly parts.
<ul style="list-style-type: none"> Ferrous and non-ferrous metals related sub-assemblies are identified. 	<ul style="list-style-type: none"> Identify ferrous and non-ferrous metals related sub-assemblies.
<ul style="list-style-type: none"> Methods of assessing serviceability of sub-assembly parts are given. 	<ul style="list-style-type: none"> Give methods of assessing serviceability of sub-assembly parts.
<ul style="list-style-type: none"> Parts are cleaned before assessment according to manufacturers, work site and safety procedures. 	<ul style="list-style-type: none"> Clean parts, before assessment, according to manufacturers, work site and safety procedures.
<ul style="list-style-type: none"> Parts are visually inspected for defects according to manufacturers' guidelines. 	<ul style="list-style-type: none"> Inspect parts visually for defects according to manufacturer's guidelines.
<ul style="list-style-type: none"> Parts are measured according to manufacturers' procedures. 	<ul style="list-style-type: none"> Measure parts according to manufacturer's procedures.
<ul style="list-style-type: none"> Measuring equipment is used according to manufacturer's procedures and job requirements. 	<ul style="list-style-type: none"> Use measuring equipment according to manufacturer's procedures and job requirements.
<ul style="list-style-type: none"> Measurements are recorded according to work site procedures. 	<ul style="list-style-type: none"> Record measurements according to work site procedures.
<ul style="list-style-type: none"> Measurements are compared to manufacturer's specifications for serviceability. 	<ul style="list-style-type: none"> Compare measurements to manufacturer's specifications for serviceability.
<ul style="list-style-type: none"> Unserviceable parts are separated and marked according to work site and quality procedures. 	<ul style="list-style-type: none"> Separate and mark unserviceable parts according to work site and quality procedures.
<ul style="list-style-type: none"> Replacement parts are ordered according to work site procedures. 	<ul style="list-style-type: none"> Order replacement parts according to work site procedures.
<ul style="list-style-type: none"> Appropriate tools and equipment are used according to safety and manufacturers procedures and job requirements. 	<ul style="list-style-type: none"> Use appropriate tools and equipment according to safety and manufacturers procedures and job requirements.
<ul style="list-style-type: none"> Parts are sorted according to ferrous and non-ferrous metal. 	<ul style="list-style-type: none"> Sort parts according to ferrous and non-ferrous metal.
<ul style="list-style-type: none"> Reason(s) for sorting ferrous and non-ferrous parts are given. 	<ul style="list-style-type: none"> Give reason(s) for sorting ferrous and non-ferrous parts.
<ul style="list-style-type: none"> Reason(s) for parts been unserviceable are given. 	<ul style="list-style-type: none"> Give reason(s) for parts been unserviceable.

ASSESSMENT TASKS OR ACTIVITIES
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks.

SUBJECT OUTCOME	
10.3 Assemble sub-assembly.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Procedures for relevant sub assembly specification/general information are obtained. 	<ul style="list-style-type: none"> • Obtain procedures for relevant sub assembly specification/general information.
<ul style="list-style-type: none"> • The principles of lubricants related to internal combustion engines are explained. 	<ul style="list-style-type: none"> • Explain the principles of lubricants related to internal combustion engines.
<ul style="list-style-type: none"> • Safety procedures related to reconditioning sub-assemblies are described. 	<ul style="list-style-type: none"> • Describe safety procedures related to reconditioning sub-assemblies.
<ul style="list-style-type: none"> • Parts are cleaned before assembly according to safety and work site procedures. 	<ul style="list-style-type: none"> • Clean parts before assembly according to safety and work site procedures.
<ul style="list-style-type: none"> • Sub-assembly is assembled according to manufacturer's procedures and specifications. 	<ul style="list-style-type: none"> • Assemble sub-assembly according to manufacturer's procedures and specifications.
<ul style="list-style-type: none"> • Attachment agents are applied according to manufacturer's procedures and job requirements. 	<ul style="list-style-type: none"> • Apply attachment agents according to manufacturer's procedures and job requirements.
<ul style="list-style-type: none"> • Specified lubricants are used during assembly. 	<ul style="list-style-type: none"> • Use specified lubricants during assembly.
<ul style="list-style-type: none"> • Measurements and/or adjustments are demonstrated during assembly according to manufacturer's procedures and specifications. 	<ul style="list-style-type: none"> • Demonstrate measurements and/or adjustments during assembly according to manufacturer's procedures and specifications.
<ul style="list-style-type: none"> • A post-test/check is demonstrated, where necessary or possible, on completion of the reconditioning procedures according to manufacturers and work site procedures. 	<ul style="list-style-type: none"> • Demonstrate a post-test/check, where necessary or possible, on completion of the reconditioning procedures, according to manufacturers and work site procedures.
<ul style="list-style-type: none"> • Sub-assembly is reconditioned according to manufacturers or work site time schedules. 	<ul style="list-style-type: none"> • Recondition sub-assembly according to manufacturers or work site time schedules.
<ul style="list-style-type: none"> • Reason(s) for using lubricants during assembly are given. 	<ul style="list-style-type: none"> • Give reason(s) for using lubricants during assembly.
<ul style="list-style-type: none"> • Reason(s) are given for cleaning parts before assembly. 	<ul style="list-style-type: none"> • Give reason(s) for cleaning parts before assembly.
<ul style="list-style-type: none"> • Reason(s) for measurements and adjustments during assembly are discussed and recorded. 	<ul style="list-style-type: none"> • Discuss and record reason(s) for measurements and adjustments during assembly.
<ul style="list-style-type: none"> • The reason(s) for post-test/checks are explained. 	<ul style="list-style-type: none"> • Explain the reason(s) for post-test/checks.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

SUBJECT OUTCOME	
10.4 Complete documentation and report on condition.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • The procedures to test/check sub-assembly prior to dismantling and after reconditioning are discussed. 	<ul style="list-style-type: none"> • Discuss the procedures to test/check sub-assembly prior to dismantling and after reconditioning.
<ul style="list-style-type: none"> • Attachment agents applicable to the task are selected and used. 	<ul style="list-style-type: none"> • Select and use attachment agents applicable to the task.
<ul style="list-style-type: none"> • Sub-assembly is prepared for storage according to manufacturer's and work site procedures. 	<ul style="list-style-type: none"> • Prepare sub-assembly for storage according to manufacturer's and work site procedures.
<ul style="list-style-type: none"> • Documentation is completed according to work site procedures. 	<ul style="list-style-type: none"> • Complete documentation according to work site procedures.
<ul style="list-style-type: none"> • Work area is restored to SHE condition according to work site procedures. 	<ul style="list-style-type: none"> • Restore work area to SHE condition according to work site procedures.
<ul style="list-style-type: none"> • Reason(s) for preparing sub-assembly for storage are given. 	<ul style="list-style-type: none"> • Give reason(s) for preparing sub-assembly for storage.
<ul style="list-style-type: none"> • The purpose of documentation is discussed. 	<ul style="list-style-type: none"> • Discuss the purpose of documentation.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

Topic 11: Test automatic transmission

SUBJECT OUTCOME	
11.1 Automatic transmission types and applications.	
ASSESSMENT STANDARD	LEARNING OUTCOME
<ul style="list-style-type: none"> • Automatic transmission components are identified and their operation described. 	<ul style="list-style-type: none"> • Identify automatic transmission components and describe their operation.
<ul style="list-style-type: none"> • Automatic transmission power flow is traced. 	<ul style="list-style-type: none"> • Trace automatic transmission power flow.
<ul style="list-style-type: none"> • Automatic transmission is serviced, adjusted and repaired. 	<ul style="list-style-type: none"> • Service, adjust and repair automatic transmissions.
<ul style="list-style-type: none"> • Automatic transmission and transaxles are diagnosed and repaired, including total rebuilding of units. 	<ul style="list-style-type: none"> • Diagnose and repair automatic transmissions and transaxles, including total rebuilding of units.
ASSESSMENT TASKS OR ACTIVITIES	
<ul style="list-style-type: none"> • Observations. • Class tests. • Demonstrations. • Practical tests. • Interviews. • Assignment/tasks. 	

4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN AUTOMOTIVE REPAIR AND MAINTENANCE - LEVEL 4

4.1 Integrated summative assessment task (ISAT)

A compulsory component of the external assessment (ESASS) is the **integrated summative assessment task (ISAT)**. The integrated summative assessment task (ISAT) draws on the student's cumulative learning achieved during the year. The task requires **integrated application of competence** and is executed and recorded in compliance with assessment conditions.

Two approaches to the integrated summative assessment task (ISAT) may be as follows:

- The students are assigned a task at the beginning of the year which they will have to complete in phases during the year to obtain an assessment mark. A final assessment is made at the end of the year when the task is completed.

OR

- Students achieve the competencies during the year but the competencies are assessed cumulatively in a single assessment or examination session at the end of the year.

The integrated summative assessment task (ISAT) is set by an externally appointed examiner and is conveyed to colleges in the first quarter of the year.

The integrated assessment approach enables students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

4.2 National Examination

A national examination is conducted annually in October or November by means of a paper(s) set and moderated externally. The following distribution of cognitive application is suggested:

LEVEL 4	KNOWLEDGE AND COMPREHENSION	APPLICATION	ANALYSIS, SYNTHESIS AND EVALUATION
	40%	50%	10%