Bicycle and Motorcycle Mechanics

Overview

The proper maintenance of bicycles and motorcycles is important for ensuring their longevity, performance, and safety. The Bicycle and Motorcycle Mechanics elective covers a range of topics including basic maintenance tasks and basic troubleshooting. Students will develop basic understanding of how bicycles and motorcycles work. This will allow them to troubleshoot common issues They will also gain practical skills to perform basic and routine maintenance tasks on bicycles and motorcycles.

Level

This elective will be offered over 3 terms in Grade 9 only at MITD Training Centres.

Competencies and range

	Competencies	**Key focus areas and range**
1.	Identify different hand tools and some specialized equipment used in bicycle and motorcycle mechanics	Open-ended spanner, Ring spanner, Combination spanner, Screwdrivers (Flat & Phillips), Combination Pliers, Ball Pein hammer, Oil can, Chain breaker tool, Tyre repair kit, Tyre gauge
2.	Identify the different types of bicycles	Touring bicycle, Mountain bicycle, Road bicycle, Electric bicycle
3.	Identify parts of a bicycle.	Tyre, Air tube, Spokes, Hub, Rim, Frame, Brake, Chain, Saddle, Pedal, Rear derailleur, Chain wheel, Freewheel, Handlebar
4.	Sketch a mountain bicycle and label its main parts.	Front wheel, Rear wheel, Handlebar, Front fork, Frame, Saddle, Pedal, Chain, Chain wheel, Freewheel
5.	Describe the function of different parts of a bicycle.	Tyre, Air tube, Frame, Brake, Chain, Handlebar
6.	Demonstrate knowledge of different systems on a bicycle	Braking system, Steering system
7.	Remove and refit the front wheel of a bicycle.	Procedure to remove wheel from fork, Procedure for refitting the wheel including alignment and centering, Operation and safety checks

8.	Lubricate the chain of a bicycle	Cleaning of chain, Application of lubricant, Operation and safety checks
9.	Identify the different types of motorcycles.	Moped, Scooter, Sport motorcycles, Off-road motorcycles, Cruiser motorcycles
10.	Identify the different parts of a motorcycle.	Headlight, Taillight, Saddle, Fuel tank, Handlebar, Front wheel, Rear wheel, Exhaust pipe, Engine, Shock absorber
11.	Sketch and label a moped.	Headlight, Taillight, Saddle, Fuel tank, Handle bar, Front wheel, Rear wheel, Muffler, Engine, Shock absorber
12.	Describe the functions of different parts of a motorcycle.	Function of: Headlight, Taillight, Saddle, Fuel tank, Handlebar, Wheels, Exhaust pipe, Engine, Shock absorber
13.	Identify parts of an engine.	Spark Plug, Valves, Piston, Connecting Rod, Crankshaft
14.	Identify the types of engines used on motorcycles.	2-stroke engine, 4-stroke engine
15.	Sketch and label the cut-sections of 2-stroke and 4-engines.	Labelling of: Spark plug, Valve, Piston, Connecting rod, Crankshaft, Cylinder, Inlet port, Transfer port, Exhaust port
16.	State the four strokes happening in a 4-stroke engine in order of occurrence.	Intake, Compression, Power, Exhaust
17.	Identify different systems of a motorcycle.	Fuel system, Cooling system, Suspension system, Electrical system
18.	Remove, inspect and refit a rear shock absorber.	Removal, Visual Inspection, Oil leakage check, Refitting procedures, Operation and safety checks
19.	Remove and renew the bulbs of a headlight and a taillight.	Correct type and wattage of bulbs, Removal of cover/ access panel, Procedure to remove bulb and insert new bulb into socket, Operation and Safety checks, Caution when handling bulbs

Duration

25 hours per school term, i.e., a total duration of 25 x 3 = 75 hours over a year

Implementation guidelines

Pre-requisites

Students need to have knowledge of safety and health protocols as applied to working in a workshop environment.

Resource requirements

(i) Mechanic workshop with good lighting and ventilation equipped with filing cabinets for storage of tools, equipment and consumables.

(ii) Complete adult bicycle, mountain bicycle type, equipped with front rubber brake pads operated with brake cable in retaining slot between brake arms, fitted with stand.

(iii) Complete 50cc motorcycle or moped fitted with two rear shock absorbers and, operational headlight and taillight in good condition, fitted with centre stand.

(iv) Tools such as:

- → Combination spanner set
- → Ring spanner set
- → Socket spanner set
- → Cone spanner
- → Flat screwdriver
- → Phillips screwdriver
- → Long nose pliers
- → Combination Pliers
- → Steel rule 30cm
- → Oil can
- → Bicycle repair stand for adult bicycle

(v) Consumables such as:

- → Chain lubricating oil
- → Chain cleaning spray
- → 1" paint brush
- → Bulbs: for headlight and taillight
- → Pieces of rags
- → Mechanic gloves

Procedure

- Workbook for each of bicycle mechanic and motorcycle mechanic will be developed and used.
- KRM version of main concepts and key words would be provided in the workbook.
- Learners will use the workbook to consolidate basic knowledge about bicycle and motorcycle mechanics through simple exercises consisting of mostly graphics.
- Learners will also be provided with demonstration on the practical aspects of bicycle and motorcycle mechanics.
- Elective will provide substantial time for learners to develop their skills through practical activities/tasks.
- Viewing the specialised setting and specialism required to teach this elective, it is proposed that the same be offered in MITD training centres only and serviced by MITD teaching personal.

Teacher and student tasks

Demonstrations and hands-on on the following:

(i) Removing and refitting of bicycle front wheel.
(ii) Lubricating a bicycle's chain.
(iii) Removing and refitting of a motorcycle/moped rear shock absorber.
(iv) Renewing the bulbs of both headlight and taillight of a motorcycle/moped.

(1) Training requirements for teachers

- MITD teaching personal to be trained on the use of the workbooks and assessment tasks.
- If part of the elective will need to be taught in secondary schools, it is proposed that Design and Technology Educators be enlisted for the same and provided with training. Training may emphasise the theoretical aspects only with the practical part done by MITD teaching personal in MITD training centres.
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(2) Events accompanying the implementation of the elective

- Development of workbooks
- Visits to examination centres (as per available logistics) or virtual tours

(3) Organisations that may be involved (Ministry and NGOs); sponsored projects

1) Ministry of Land Transport (if and required)
2) Vehicle examinations centres (fitness centres)

(4) Safety measures

1) Adherence to health and safety protocols within a workshop setting.
2) Wearing of personal protective equipment, e.g. wearing of gloves and safety glasses.
3) Specific safety measures for the elective as follows:

(i) Use of bicycle repair stand to prevent bicycle fall which can cause injury.
(ii) Ensuring Motorcycle/Moped has centre stand in good condition.
(iii) Arrangements to clean the oily floor after lubricating chain.
(iv) Using the right tool for the job at hand.
(v) Working cautiously and avoid pinching of hands.
(vi) Refitting back a shock absorber before removing the other one on the other side.
(vii) The ignition switch and lighting switches must be OFF to avoid sparking at bulb holders especially if battery is connected

(5) Cross-curricular elements

- Sustainability including environmental concerns.
- Safety and health within workshop settings.

(6) Evaluation

- Continuous assessment
- Criterion-referenced assessment
- Elements of oral, written and practical assessment
- Practical assessment will relate to the following (all or part):

➢ Removing and refitting of bicycle front wheel.
➢ Lubricating a bicycle's chain.
➢ Removing and refitting of a motorcycle/moped rear shock absorber.
➢ Renewing the bulbs of both headlight and taillight of a motorcycle/moped.

Exemplar assessment criteria

For removing and refitting a bicycle front wheel

Assessment criteria	Maximum marks	Marks scored
Ability to select the proper tools.	4	
Ability to place the bicycle on repair stand securely.	4	
Ability to loosen the brake cable.	4	
Ability to remove the front wheel of the bicycle.	4	
Ability to inspect the wheel for cracks and freeplay.	4	
Ability to adjust axle freeplay.	4	
Ability to tighten back the front wheel in its fork.	4	
Ability to adjust back the front brake cable tension.	4	
Ability to adopt safe workshop practices.	4	
Overall performance of trainee at task.	4	
Total Marks	**40**	

For removing and refitting a motorcycle/moped rear shock absorber

Assessment criteria	Maximum marks	Marks scored
Ability to select the proper tools.	4	
Ability to place the motorcycle on its centre stand securely.	4	
Ability to remove the shock absorbers using the socket spanner.	4	
Ability to examine the shock absorbers for oil leaks or damage.	4	
Ability to replace the shock absorbers on the frame and swinging arm.	4	
Ability to replace the shock absorbers in the right position and side.	4	
Ability to tighten the bolts securely but do not overtighten.	4	
Ability to observe general workshop safety rules.	4	
Ability to adopt safe work practices when using tools and equipment.	4	
Overall performance of trainee at task.	4	
Total Marks	**40**	

Student Progress Card for the elective

	Not Attained	Partially Attained	Attained
Competency 1: Identify different hand tools and some specialized equipment used in bicycle and motorcycle mechanics			
Competency 2: Identify the different types of bicycles			
Competency 3: Identify parts of a bicycle.			
Competency 4: Sketch a mountain bicycle and label its main parts.			
Competency 5: Describe the function of different parts of a bicycle.			
Competency 6: Demonstrate knowledge of different systems on a bicycle.			
Competency 7: Remove and refit the front wheel of a bicycle.			
Competency 8: Lubricate the chain of a bicycle.			
Competency 9: Identify the different types of motorcycles.			
Competency 10: Identify the different parts of a motorcycle.			
Competency 11: Sketch and label a moped.			
Competency 12: Describe the functions of different parts of a motorcycle.			
Competency 13: Identify parts of an engine.			
Competency 14: Identify the types of engines used on motorcycles.			
Competency 15: Sketch and label the cut-sections of 2-stroke and 4-engines.			
Competency 16: State the four strokes happening in a 4-stroke engine in order of occurrence.			
Competency 17: Identify different systems of a motorcycle.			
Competency 18: Remove, inspect and refit a shock absorber.			
Competency 19: Remove and renew the bulbs of a headlight and a taillight.			

15. Other elements

- Awaiting full refurbishing of MITD centres in terms of facilities and training personal, only bicycle mechanics can be offered for year 2025 in secondary schools provided the required accessories, tools and equipment are provided. Also, consideration for MITD training personal to go to secondary schools to teach the elective should be given or alternatively Design and Technology Educators to teach the elective after their approval and training.