Maintenance & Repair - Motorcycle
(Syllabus content)

Assessment Requirements

Unit G01/02K – Knowledge of Health, Safety and Good Housekeeping in the Automotive Environment

Content:

Economic use of Resources

a. consumable materials e.g. grease, oils, split pins, locking and fastening devices etc.

Requirement to maintain work area effectively

a. cleaning tools and equipment to maximise workplace efficiency.
b. requirement to carry out the housekeeping activities safely and in a way that minimises inconvenience to customers and staff.
c. risks involved when using solvents and detergents.
d. advantages of good housekeeping.

Spillages, leaks and waste materials

a. relevance of safe systems of work to the storage and disposal of waste materials.
b. requirement to store and dispose of waste, used materials and debris correctly.
c. safe disposal of special / hazardous waste materials.
d. advantages of recycling waste materials.
e. dealing with spillages and leaks

Basic legislative requirements

a. Provision and Use of Work Equipment Regulations 1992.
b. Power Presses Regulations 1992.
c. Pressure Systems and Transportable Gas Containers Regulations 1989.
d. Electricity at Work Regulations 1989.
e. Noise at Work Regulations 1989.
f. Manual Handling Operations Regulations 1992.
g. Health and Safety (Display Screen Equipment) Regulations 1992.
h. Abrasive Wheel Regulations.
i. Safe Working Loads.
j. Working at Height Regulations (date)

Routine maintenance of the workplace

a. Trainees personal responsibilities and limits of their authority with regard to work equipment.
b. Risk assessment of the workplace activities and work equipment.
c. Workplace person responsible for training and maintenance of workplace equipment.
d. When and why safety equipment must be used.
e. Location of safety equipment.
f. Particular hazards associated with their work area and equipment.
g. Prohibited areas.
h. Plant and machinery that trainees must **not** use or operate.
i. Why and how faults on unsafe equipment should be reported.
j. Storing tools, equipment and products safely and appropriately.
k. Using the correct PPE.
l. Following manufacturers' recommendations.

m. Location of routine maintenance information e.g. electrical safety check log.

Legislation relevant to Health and Safety

i. HASAWA
ii. COSHH
iii. EPA
iv. Manual Handling Operations Regulations 1992
v. PPE Regulations 1992

General regulations to include an awareness of:

i. Health and Safety (Display Screen Equipment) Regulations 1992
ii. Health and Safety (First Aid) Regulations 1981
iii. Health and Safety (Safety Signs and Signals) Regulations 1996
iv. Health and Safety (Consultation with Employees) Regulations 1996
v. Employers Liability (Compulsory Insurance) Act 1969 and Regulations 1998
vi. Confined Spaces Regulations 1997
vii. Noise at Work Regulations 1989
viii. Electricity at Work Regulations 1989
ix. Electricity (Safety) Regulations 1994
x. Fire Precautions Act 1971
xi. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1985
xii. Pressure Systems Safety Regulations 2000
xiii. Waste Management 1991
xiv. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002
xv. Control of Asbestos at Work Regulations 2002

Legislative duties

a. The purpose of a Health and Safety Policy.
b. The relevance of the Health and Safety Executive.
c. The relevance of an initial induction to Health and Safety requirements at your workplace.
d. General employee responsibilities under the HASAWA and the consequences of non-compliance.
e. General employer responsibilities under the HASAWA and the consequences of non-compliance.
f. The limits of authority with regard to Health and Safety within a personal job role.
g. Workplace procedure to be followed to report Health and Safety matters.

Precautions to be taken when working with vehicles, workshop materials, tools and equipment including electrical safety, pneumatics and hydraulics

a. Accessing and interpreting safety information
b. Seeking advice when needed
c. Seeking assistance when required
d. Reporting of unsafe equipment
e. Storing tools, equipment and products safely and appropriately
f. Using the correct PPE
g. Following manufacturers recommendations
h. Following application procedures e.g. hazardous substances
i. The correct selection and use of extraction equipment

PPE to include:

a. Typical maintenance procedures for PPE equipment to include:

i. typical maintenance log
ii. cleaning procedures
iii. filter maintenance
iv. variation in glove types

v. air quality checks

b Choice and fitting procedures for masks and air breathing equipment.

c. Typical workplace processes which would require the use of PPE to include:

i. welding
ii. sanding and grinding
iii. filling
iv. panel removal and replacement
v. drilling
vi. cutting
vii. chiselling
viii. removal of broken glass
ix. removal of rubber seals from fire damaged vehicles
x. removal of hypodermic needles
xi. servicing activities
xii. roadside recovery

d. Unserviceable PPE.

e. PPE required for a range automotive repair activities. To include appropriate protection of:

i. eyes
ii. ears
iii. head
iv. skin
v. feet
vi. hands
vii. lungs

Fire and extinguishers

a. Classification of fire types
b. Using a fire extinguisher effectively.

Types of Extinguishers

a. foam
b. dry powder
c. CO2
d. water
e. fire blanket

Action to be taken in the event of a fire to include:

a. The procedure as:

i. raise the alarm
ii. fight fire only if appropriate
iii. evacuate building
iv. call for assistance

Product warning labels to include:

a. Reasons for placing warning labels on containers.
b. Warning labels in common use, to include:

i. toxic
ii. corrosive
iii. poisonous
iv. harmful
v. irritant
vi. flammable
vii. explosive

Warning signs and notices

a. Colours used for warning signs:

i. red
ii. blue
iii. green

b Shapes and meaning of warning signs:
i. round
ii. triangular
iii. square

c. The meaning of prohibitive warning signs in common use.
d. The meaning of mandatory warning signs in common use.
e. The meaning of warning notices in common use.
f. General design of safe place warning signs.

Hazards and risks to include:

a. The difference between a risk and a hazard.
b. Potential risks resulting from:
i. the use and maintenance of machinery or equipment
ii. the use of materials or substances
iii. accidental breakages and spillages
iv. unsafe behaviour
v. working practices that do not conform to laid down policies
vi. environmental factors
vii. personal presentation
viii. unauthorised personal, customers, contractors etc entering your work premises
ix. working by the roadside
x. vehicle recovery
c. The employee's responsibilities in identifying and reporting risks within their working environment.
d. The method of reporting risks that are outside your limits of authority.
e. Potential causes of:

i. fire
ii. explosion
iii. noise
iv. harmful fumes
v. slips
vi. trips
vii falling objects
viii accidents whilst dealing with broken down vehicles

Personal responsibilities

a. The purpose of workplace policies and procedures on:
i. the use of safe working methods and equipment
ii. the safe use of hazardous substances
iii. smoking, eating , drinking and drugs
iv. emergency procedures
v. personal appearance
b. The importance of personal appearance in the control of health and safety.

Action to be taken in the event of colleagues suffering accidents

a. The typical sequence of events following the discovery of an accident such as:
i. make the area safe
ii. remove hazards if appropriate i.e. switch off power
iii. administer minor first aid
iv. take appropriate action to re-assure the injured party
v. raise the alarm

vi. get help
vii. report on the accident

b Typical examples of first aid which can be administered by persons at the scene of an accident:

i. check for consciousness
ii. stem bleeding
iii. keep the injured person's airways free
iv. place in the recovery position if injured person is unconscious
v. issue plasters for minor cuts
vi. action to prevent shock i.e. keep the injured party warm
vii. administer water for minor burns or chemical injuries
viii. wash eyes with water to remove dust or ingress of chemicals (battery acid)
ix. need to seek professional help for serious injuries

c Examples of bad practice which may result in further injury such as:

i. moving the injured party
ii. removing foreign objects from wounds or eyes
iii. inducing vomiting
iv straightening deformed limbs

Assessment Requirements

Unit G3K – Knowledge of Support for Job Roles in the Automotive Environment

Content:

The structure of a typical vehicle repair business

a. How these areas relate to each other within the business

i. body shop
ii. vehicle repair workshop
iii. paint shop
iv. valeting
v. vehicle parts store
vi. main office
vii. vehicle sales
viii. reception

b. Sources of information

i. other staff
ii. manuals
iii. parts lists
iv. computer software and the internet
v. manufacturer
vi. diagnostic equipment

Communication requirements when carrying out vehicle repairs

a. Locating and using correct documentation and information for:

i. recording vehicle maintenance and repairs
ii. vehicle specifications
iii. component specifications
iv. oil and fluid specifications
v. equipment and tools
vi. identification codes

b. Procedures for:

i. referral of problems
ii. reporting delays
iii. additional work identified during repair or maintenance
iv. keeping others informed of progress

Methods of Communication

i. verbal
ii. signs and notices

iii. memos
iv. telephone
v. electronic mail
vi. vehicle job card
vii. notice boards
viii. SMS text messaging
ix. Letters

a. Organisational & Customer requirements:

i. importance of time scales to customer and organization
ii. relationship between time and costs
iii. meaning of profit

b. Choice of Communication

i. distance
ii. location
iii. job responsibility

b. Importance of maintaining positive working relationships:

i. morale
ii. productivity
iii. company image
iv. customer relationships
v. colleagues

Assessment Requirements

Unit G4K – Knowledge of Materials, Fabrication, Tools and Measuring Devices used in the Automotive Environment

Content:

Common types of hand tools used for fabricating and fitting in the automotive workplace. To include:

a. files
b. hacksaws and snips
c. hammers
d. screwdrivers
e. pliers
f. spanners
g. sockets
h. punches
i. types of drill and drill bits
j. taps and dies
k. stud removers
l. marking out tools

Common measuring devices used for fabrication and fitting in the automotive workplace. To include:

a. rule/tape
b. callipers
c. feeler gauge
d. volume measures
e. micrometer
f. dial gauges
g. torque wrenches
h. depth gauges

Common electrical measuring tools used in the repair of vehicles and components. To include:

a. ammeter
b. voltmeter
c. ohmmeter
d. multi-meter

Common electrical terms when measuring:

a. voltage
b. current
c. resistance

Workshop equipment (including appropriate PPE). To include:

a. hydraulic jacks
b. axle stands
c. pillar drills
d. air tools
e. vehicle lifts
f. cranes

g. hoists
h. electrical power tools

Properties, application and limitations (to include safe use) of ferrous and non-ferrous metals used when constructing, modifying and repairing vehicles and components. Materials to include:

a. carbon steels
b. alloy steels
c. cast iron
d. aluminium alloys
e. brass
f. copper
g. lead

Properties, application and limitations (to include safe use) of non-metallic materials used when constructing, modifying and repairing vehicles and components. Materials to include:

a. glass
b. plastics (inc. GRP)
c. Kevlar
d. rubber

Terms relating to the properties of materials. To include:

a. hardness
b. toughness
c. ductility
d. elasticity
e. tenacity
f. malleability
g. plasticity

Assessment Requirements

Unit G6K – Knowledge of how to Make Learning Possible through Demonstrations and Instruction

Content:

Separate areas of demonstration which encourage learning. To include:

a. demonstration is particularly applicable to learning manual skills.
b. learning to do something usually involves:
    i. purpose – the aim or objective
    ii. procedure - the most effective way of completing the task
    iii. practice – all skills require practice to improve
c. practical tasks are more quickly learnt through demonstration.
d. emphasis is required to body movements when demonstrating.
e. the demonstrator should encourage learners to ask questions.
f. emphasis should be placed upon key points whilst demonstrating.
g. any demonstration should ensure that all safety aspects are covered.

Types of learning which are best achieved and supported through demonstrations. **To include:**

a. types of learning:
    i. psychomotor – measurement of manual skill performance
    ii. cognitive – learning involving thought processes
    iii. affective – demonstration of feelings, emotions or attitudes
b. demonstration - involves learning to do something (Psychomotor Domain).
c. combination of instruction and practical demonstrations are very effective means of learning practical skills.

How to structure demonstration and instruction sessions. To include:

a. Before the demonstration and/or instruction ensure that the following good practice is recognised:
    i. identify key points
    ii. relate theoretical underpinning knowledge to key points
    iii. rehearse to ensure that all equipment is working
    iv. ensure all students can see even small equipment and processes
    v. time the demonstration
    vi. consider how to make students participate
    vii. consider how to emphasise safe working practices
b. During the demonstration and/or instruction good practice is to:
    i. give a clear introduction
    ii. identify any tools/equipment
    iii. determine the current audience level of knowledge
    iv. complete the demonstration correctly (do not show how not to do it)
    v. stress key points and show links between them
    vi. monitor safety aspects
    vii. check learner understanding
c. After the demonstration(if possible)
    i. enable the audience to practice the techniques
    ii. provide feedback on their performance

How to identify individual learning needs

a. Diagnose the learning needs of your audience to include:

i. what competencies they already have
ii. what experience they have of the subject area
iii. what competencies they need to achieve
iv. what demonstration techniques are best suited to their needs
iv. how you will assess their needs have been met

What factors are likely to prevent learning. To include:

i. language barriers
ii. physical barriers
iii. specialist knowledge
iv. pace of learning
v. method of delivery
vi. environmental factors
vii. teaching styles
viii. dyslexia

How to check learners understanding and progress

a. Questionnaires.
b. Verbal questioning.
c. Observation.
d. Assessment.
e. Role play.
f. Projects/assignments.
g. Multi-choice questions.
h. Simulation.
i. Tests.

How to organise information and prepare materials

a. Identify the course aim.
b. Identify the subject aim.
c. Identify the lesson aim.
d. Complete a lesson plan - plan the teaching.
e. Identify a series of 'cues' to be used during the lesson.
f. Logically organise the information.
g. Use suitable resources and equipment to maximise learning opportunities.
h. Assess the learners progress and understanding.

Instructional techniques

a. types of instructional techniques to include:
   i. lectures
   ii. handouts
   iii. team teaching
   iv. peer teaching
   v. discussion – individual, group and peer
   vi. question and answer
   vii. multimedia
   viii. seminars
   ix. case studies
   x. project/assignments

Environmental factors that effect learning

a. environmental factors that should be considered before demonstration/instruction to include:
   i. loud noises
   ii. bright colours
   iii. bright lights

iv. strong smells
v. atmosphere
vi. temperature
vii. classroom seating
viii. classroom layout
ix. bright lights

Health and safety factors that affect learning

a. health and safety factors that should be considered before demonstration/instruction to include:
   i. assessment of risk and hazards
   ii. condition of electrical/electronic equipment
   iii. position of cables and wires
   iv. safety of equipment used in demonstration/instruction
   v. condition of classroom equipment/furniture/structure
   vi. suitable protective clothing/equipment

Analysis of demonstration/instruction

a. Analysis of demonstration/instruction to include:
   i. feedback from students
   ii. feedback from colleagues
   iii. organisational quality assessment
   iv. feedback from external organisations
   v. awarding body requirements

Developments in learning. To include:

i. multimedia based materials
ii. web based materials
iii interactive materials

How to choose and prepare appropriate materials. To include:

a. putting information in order
b. deciding whether the language used is appropriate
c. type of material i.e. paper and technology based etc.

Assessment Requirements

Unit G8K – Knowledge of how to Identify and Agree Customer Service Needs

Content:

Organisational Requirements

a. Explain the organisation's terms and conditions applicable to the acceptance of customer vehicles.
b. Explain the content and limitations of vehicle and component warranties for the vehicles dealt with by your organisation.
c. Detail what, if any, limits there are to the authority for accepting vehicles.
d. Detail why it is important to keep customers advised of progress and how this is achieved within the organisation.
e. Detail the organisation's procedures for the completion and processing of documentation and records, including payment methods and obtaining customer signatures as applicable.

Principles of Customer Communication and Care.

a. First Impressions.
b. Listening skills – 80:20 ratio.
c. Eye contact and smiling.
d. Showing interest and concern.
e. Questioning techniques and customer qualification.
f. Giving clear non-technical explanations.
g. Confirming understanding (statement/question technique, reflective summary).
h. Written communication – purpose, content, presentation and style.
i. Providing a high quality service – fulfilling (ideally exceeding) customer expectations within agreed time frames.
j. Obtaining customer feedback and corrective actions when dissatisfaction expressed.
k. Dealing with complaints.

Company Products and Services

a. Service standards
    i. national
    ii. manufacturer
    iii. organisational
b. The range and type of services offered by the organisation.
    i. diagnostic.
    ii. servicing.
    iii. repair.
    iv. warranty.
    v. MOT testing.
    vi. fitment of accessories/enhancements.
    vii. internal.
c. The courses of action available to resolve customer problems.
    i. the extent and nature of the work to be undertaken.
    ii. the terms and conditions of acceptance.
    iii. the cost.
    iv. the timescale.
    v. required payment methods.

d. The effect of resource availability upon the receipt of customer vehicles and the completion of work.
    i. levels and availability of equipment.
    ii. levels and availability of technicians.
    iii. workshop loading systems.
e. How to access costing and work completion time information.
    i. manuals.
    ii. computer based.

Vehicle Information Systems, Servicing and Repair Requirements

a. Accessing technical data including diagnostics.
b. Servicing to manufacturer requirements/standards.
c. Repair/operating procedures.
d. MOT standards/requirements.
e. Quality controls – interim and final.
f. Requirements for cleanliness of vehicle on return to customer.
g. Handover procedures.

Consumer Legislation To include:

a. consumer protection
b. sale of goods
c. data protection
d. product liability
e. health and safety
f. discrimination

Assessment Requirements

Unit MC01K – Knowledge of Routine Motorcycle Maintenance

Content:

Motorcycle maintenance, inspection and adjustment and record findings

Motorcycle inspection techniques used in routine maintenance including:

i. aural
ii. visual and functional assessments on engine systems
iii. visual and functional assessments on transmission power train
iv. chassis systems
v. wheels and tyres
vi. electrical and electronic systems
vii. motorcycle fame and components

The procedures used for inspecting the condition and serviceability of the following:

i. filters
ii. drive belts
iii. cables
iv. brake linings
v. pads
vi. ignition components
vii. hoses
viii. tyres
ix. lights
x. chain and sprockets
xi. steering and suspension
xii. battery and charging

The procedures used for checking gaps and clearances:

i. ignition components
ii. carburettor
iii. valve clearances
iv. clutch
v. drive train
vi. brakes

Preparation and use appropriate use of equipment to include:

i. test instruments
ii. emission equipment
iii. wheel alignment
iv. beam setting equipment
v. tyre tread depth gauges

Procedures for checking and replenishing fluid levels:

i. oil
ii. water
iii. hydraulic fluids
iv. greases

Procedures for checking and replacement of lubricants:

i. replace oil filters
ii. check levels
iii. types of oil

iv. cleanliness
v. disposal of old oil and filters

Procedures for carrying out adjustments on motorcycle systems or components:
i. clearances
ii. settings
iii. alignment
iv. operational performance (engine idle, exhaust gas)

Procedures for checking electrical systems:
i. operation
ii. security
iii. performance

Importance and process of detailed inspection procedures:
i. following inspection checklists
ii. checking conformity to manufacturer's specifications
iii. UK and European legal requirements

Importance and process of completing all relevant documentation relating to motorcycle maintenance:
i. inspection records
ii. job cards
iii. motorcycle repair records
iv. motorcycle service history

The need to use motorcycle protection prior to service and repair

Requirements and methods used for protecting:
i. motorcycle body panels
ii. paint surfaces
iii. chrome surfaces

The need to check the motorcycle prior to routine maintenance

The need to inspect the motorcycle following routine maintenance:
i. professional presentation of motorcycle
ii. customer perceptions

The basic checks of motorcycle following routine maintenance:
i. removal of oil and grease marks
ii. body panels
iii. chrome
iv. paint surfaces
v. motorcycle controls
vi. re-instatement of components

Different systems to be inspected while carrying out motorcycle routine maintenance.
i. engine and power train systems
ii. chassis systems
iii. wheels and tyres
iv. electrical and electronic systems
v. motorcycle frame and components

Assessment Requirements

Unit MC02.1K – Knowledge of Motorcycle Internal Engine Systems

Content:

Engines

a. Engine types and configurations:
   i. inline
   ii. flat
   iii. vee
   iv. four-stroke and two-stroke cycle for spark ignition engines
   v. naturally aspirated and turbo-charged engines

b. Relative advantages and disadvantages of different engine types and configurations.

c. Engine components and layouts:
   i. single (OHC) and multi camshaft (DOHC)
   ii. single and multi cylinder (2, 3, 4, 6 cylinder types)
   iii. port design: inlet, transfer and exhaust

d. Cylinder head layout and design, combustion chamber and piston design.

e. The procedures used when inspecting engines

f. The procedures to assess:
   i. serviceability
   ii. wear
   iii. condition
   iv. clearances
   v. settings
   vi. linkages
   vii. joints
   viii. fluid systems
   ix. adjustments
   x. operation and functionality
   xi. security

g. Symptoms and faults associated with mechanical engine operation:
   i. poor performance
   ii. abnormal or excessive mechanical noise
   iii. erratic running
   iv. low power
   v exhaust emissions
   v. abnormal exhaust smoke
   vi. unable to start
   vii. exhaust gas leaks to cooling system
   viii. exhaust gas leaks

Lubrication

a. The advantages and disadvantages of wet and dry systems.

b. Engine lubrication system:
   i. splash and pressurised systems
   ii. pumps
   iii. pressure relief valve
   iv. filters
   v. oil ways
   vi. oil coolers

c. Terms associated with lubrication and engine oil:
   i. full-flow
   ii. hydrodynamic
   iii. boundary
   iv. viscosity
   v. multi-grade
   vi. natural and synthetic oil
   vii. viscosity index
   viii multi-grade

d. The requirements and features of engine oil:
   i. operating temperatures
   ii. pressures
   iii. lubricant grades
   iv. viscosity
   v. multi-grade oil
   vi. additives
   vii. detergents
   viii. dispersants
   ix. anti-oxidants inhibitors
   x. anti-foaming agents
   xi. anti-wear
   xii. synthetic oils
   xiii. organic oils
   xiv mineral oils

e. Symptoms and faults associated with lubrication systems:
   h. excessive oil consumption
   ii oil leaks
   iii. oil in water
   iv low or excessive pressure
   v. oil contamination

f. The procedures used when inspecting lubrication system

Cooling,

a. The components, operating principles, and functions of engine cooling systems

b. Procedures used to remove, replace and adjust cooling system components

   i. cooling fans and control devices
   ii. fins and cowlings
   iii. header tanks, radiators and pressure caps
   iv expansion tanks hoses, clips and pipes
   v. thermostats impellers and coolant

c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement
    i. system pressure testers
    ii. pressure cap testers
    iii. anti-freeze testing equipment
    iv. chemical tests for the detection of combustion gas

d. Symptoms and faults associated with cooling systems:
    i. water leaks
    ii. water in oil
    iii. blocked fins
    iv excessively low or high coolant temperature

e. The procedures used when inspecting
    i. cooling systems

Clutch

a. The components, operating principles, and functions of clutch's
    i. wet clutch
    ii. dry clutch
    iii. centrifugal
    iv. cable control
    v. hydraulic control

b. Procedures used to remove, replace and adjust clutch systems and components

c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement

d. Symptoms and faults associated with clutch systems
    i. slip
    ii. drag

Transmission

a The components, operating principles, and function of transmission systems
    i. conventional gear
    ii CVT
    iii Automatic

b. the operating components within transmission systems
    i. gears
    ii. shafts
    iii. selectors
    iv. shift lever and drum mechanisms
    v. bearings
    vi. pulleys

c. The preparation and method of use of appropriate specialist equipment used to evaluate transmission system performance following component replacement

d. Procedures used to remove, replace and adjust transmission systems and components

e. Symptoms and faults associated with transmission systems
    i. abnormal noises
    ii. vibration
    iii. fluid leaks

iv wear
v. gear selection

General

a. The preparation, testing and use of tools and equipment used for:
   i. dismantling
   ii. removal and replacement of engine mechanical and power train system components

b. Appropriate safety precautions:
   i. PPE
   ii. motorcycle protection when dismantling
   iii. removal and replacing engine mechanical and power train units and components
c. The important of logical and systematic processes.
d. The inspection and testing of engine mechanical and power train units and components.
e. The preparation of replacement units for re-fitting or replacement.
f. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.
g. Refitting procedures.
h. The inspection and testing of units and system to ensure compliance with manufacturer's, legal and performance requirements.
i. The inspection and re-instatement of the motorcycle following repair to ensure customer satisfaction;
   i. cleanliness of motorcycle
   ii. security of components and fittings
   iii. re-instatement of components and fittings

j. construction and operation of motorcycle engine mechanical systems
   a. four stroke
   b. two stroke

k. key engineering principles that are related to engine mechanical systems
   a. compression ratio's
   b. volumetric efficiency
   c. cylinder capacity

l. common terms used in motorcycle engine mechanical system design
   a. tdc
   b. bdc
   c. stroke
   d. bore
   e. ports

m. construction and operation of motorcycle engine lubrication components and systems
   a. full flow
   b. by pass
   c. wet sump
   d. dry sump
   e. total loss

n. key engineering principles that are related to motorcycle engine lubrication systems
   a. classification of lubricants
   b. properties of lubricants
   c. methods of reducing friction

o. common terms used in motorcycle engine lubrication system design

p. identify motorcycle engine cooling system components
   a. air cooling
   b. liquid cooling

q. key engineering principles that are related to motorcycle engine cooling systems
   a. heat transfer
   b. linear and cubical expansion
   c. specific heat capacity
   d. boiling point of liquids

r. construction and operation of motorcycle clutch and transmission system components
   a. dry clutch
   b. wet clutch
   c. constant mesh
   d. CVT
   e. automatic
   f. chain and sprocket
   g. shaft and gear
   h. belt and pulley

Assessment Requirements

Unit MC02.2K – Knowledge of Motorcycle Fuel, Ignition, Air and Exhaust System Units and Components

Content:

Fuel - Petrol

a. The function and layout of carburettor systems:
   i. carburettor, single and multi-type
   ii. fuel tank and control lever
   iii. fuel pumps

b. The operation of carburettor systems
   i. carburettor, single and multi-type
   ii. float chamber and designs
   iii. vacuum and piston assembly
   iv. needles and jets
   v. adjustment for idle and mixture
   vi. choke and enrichment devise
   vii. fuel tank and control lever
   viii. fuel pumps

c. The function of petrol injection systems and components
   i. petrol injection systems
   ii. injection components
   iii. injection pump
   iv. pump relay
   v. injector valve
   vi. air flow sensor
   vii. throttle potentiometer
   viii. idle speed control valve
   ix. coolant sensor
   x. MAP and air temperature sensors
   xi. mechanical control devices
   xii. electronic control units

d. The operation petrol injection systems and components:
   i. injection pump
   ii. pump relay
   iii. injector valve
   iv. air flow sensor
   v. throttle potentiometer
   vi. idle speed control valve
   vii. coolant sensor
   viii. MAP and air temperature sensors
   ix. electronic control units
   x. fuel pressure regulators
   xi. fuel pump relays
   xii. lambda exhaust sensors
   xiii. flywheel and camshaft sensors
   xiv. air flow sensors (air flow meter and air mass meter)

e. The procedures used when inspecting petrol system
f. The chemically correct air/fuel ratio for petrol engines
g. weak and rich air/fuel ratios for petrol engines.

h. exhaust composition and by-products for chemically correct, rich and weak air/fuel ratios of petrol engines:

i. water vapour (H2O)
ii. nitrogen (N)
iii. carbon monoxide (CO)
iv. carbon dioxide (CO2)
v. carbon (C)
vi. hydrocarbon (HC)
vii. oxides of nitrogen (NOx, NO2, NO) and particulates

i. Symptoms and faults associated with fuel systems

i. erratic running
ii. weak mixture
iii. rich mixture
iv. two stroke mixtures
v. excessive smoke
vi. leaks
vii. failure to start
viii. poor economy
ix. failure to meet emission control

Ignition

a. The layout of ignition systems,
b. ignition circuits and components:

i. LT Circuit
ii. battery
iii. ignition switch
iv. electronic trigger devices
v. HT Circuit
vi. spark plugs (reach, heat range, electrode features
vii. ignition leads
viii. ignition coil
ix. ignition timing advance system

c. The operation electronic system components:

i. amplifiers
ii. triggering systems
iii. inductive pick-ups
iv. amplifier units.
v. control units

d. Ignition terminology:

i. dwell angle
ii. dwell time
iii. advance and retard of ignition timing
iv. static and dynamic ignition timing

e. The operation of electronic ignition systems under various conditions and loads to include:

i. engine idling
ii. during acceleration
iii. under full load

iv. cruising
v. overrun
vi cold starting

f. Basic principle of engine management systems:
   i. closed loop system
   ii. integrated ignition
   iii. injection systems
   iv sensors

g. The procedures used when inspecting
   i. ignition system
   ii. engine management
   iv. sensors

h. Symptoms and faults associated with ignition system operation
   i. failure to start hot or cold
   ii. exhaust emissions
   iii. poor performance
   iv. ignition noise
   v. misfire
   vi. damp

Air supply and exhaust systems

i. The construction and purpose of air filtration systems.
ii. The operating principles of air filtration systems.
iii. The construction and purpose of the exhaust systems.
iv. The operating principles of the systems.
v. Exhaust system design to include silencers and catalytic converters.
vi. The procedures used when inspecting induction, air filtration and exhaust systems
vii. Symptoms and faults associated with air and exhaust systems

General

k. The preparation, testing and use of tools and equipment used for:
   i. dismantling
   ii. removal and replacement of engine units and components
l. Appropriate safety precautions:
   i. PPE
   ii. motorcycle protection when dismantling
   iii. removal and replacing engine units and components
m. The important of logical and systematic processes.
n. The inspection and testing of engine units and components.
o. The preparation of replacement units for re-fitting or replacement.
p. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.
q. Refitting procedures.
r. The inspection and testing of units and system to ensure compliance with manufacturer's, legal and performance requirements.
s. The inspection and re-instatement of the motorcycle following repair to ensure customer satisfaction;
   i. cleanliness of motorcycle interior and exterior
   ii. security of components and fittings
t. re-instatement of components and fittings

u. construction and operation of motorcycle engine fuel systems
   a) carburettor
   b) multi point injection

v.. key engineering principles that are related to motorcycle engine fuel systems
   a) properties of fuels
   b) combustion processes
   c) exhaust gas constituents

w. key engineering principles that are related to motorcycle engine ignition systems
   a) flame travel
   b) ignition timing
   c) voltages

x. construction and operation of motorcycle engine air supply and exhaust systems
   a) manifolds
   b) filters
   c) silencers, including two stroke
   d) catalytic converter

y. key engineering principles that are related to motorcycle engine air supply and exhaust systems
   a) sound absorption
   b) reduction of harmful emissions

Assessment Requirements

Unit MC03K – Knowledge of Removing and Replacing Motorcycle Electrical Units and Components

Content:

Electrical/Electronic Principles

a. Electrical units:
    i. volt (electrical pressure)
    ii. ampere (electrical current)
    iii. ohm (electrical resistance)
    iv. watt (power)
b. The requirements for an electrical circuit:
    i. battery
    ii. cables
    iii. switch
    iv. current consuming device
    v. continuity
c. The direction of current flow and electron flow.
d. Series and parallel circuits to include:
    i. current flow
    ii. voltage of components
    iii. volt drop
    iv. resistance
    v. the effect on circuit operation of open circuit component(s)
e. Earth and insulated return systems.
f. Cable sizes and colour codes.
g. Different types of connectors, terminals and circuit protection devices.
h. Common electrical and electronic symbols.

i. The meaning of:
    i. short circuit
    ii. open circuit
    iii. bad earth
    iv. high resistance
    v. electrical capacity

j. The principles of motorcycle electronic systems and component.

k. Interpret motorcycle wiring diagrams to include:
    i. motorcycle lighting
    ii. auxiliary circuits
    iii. indicators
    iv. starting and charging systems

l. Function and construction of electrical components including:
    i. circuit relays
    ii. bulb types
    iii. cooling fan
    iv. circuit protection

m. The safety precautions when working on electrical and electronic systems to include:
    i. disconnection and connection of battery
    ii. avoidance of short circuits
    iii. power surges
    iv. prevention of electric shock
    v. protection of electrical and electronic components
    vi. protection of circuits from overload or damage

n. The set-up and use of:
    i. digital and analogue multi-meters
    ii. voltmeter
    iii. ammeter
    iv. ohmmeter
    v. oscilloscope
    vi. manufacturer's dedicated test equipment

o. Electrical and electronic checks for electrical and electronic systems to include:
    i. connections
    ii. security
    iii. functionality
    iv. performance to specifications
    v. continuity, open circuit
    vi. short circuit
    vii. high resistance
    viii. volt drop
    ix. current consumption
    x. output patterns (oscilloscope)

p. Symptoms and faults associated with electrical and electronic systems to include:
    i. high resistance
    ii. loose and corroded connections
    iii. short circuit
    iv. excessive current consumption
    v. open circuit
    vi. malfunction
    vii. poor performance
    viii. battery faults to include flat battery
    ix. failure to hold charge
    x. low state of charge

xi. overheating
xii. poor starting

Battery and Charging

The construction and operation of motorcycle batteries including:

i. low maintenance and maintenance free
ii. lead acid and nickel cadmium types
iii. cells
iv. separators
v. plates
vi. electrolyte

The operation of the motorcycle charging system:

i. alternator
ii. rotor
iii. stator
iv. slip ring
v. brush assembly
vi. three phase output
vii. diode rectification pack
viii. voltage regulation
ix. phased winding connections
x. cooling fan
xi alternator drive

Starting

a. The layout, construction and operation of engine starting systems:
b. The function and operation of the following components:

i. starter motor
ii. starter clutch mechanism
iii. pinion
iv. starter solenoid
v. clutch and gear safety switch
vi. ignition/starter switch
vii. stand switches
viii. starter relay (if appropriate)

Lighting

a. Function and construction of electrical components including:

i. front and tail lamps
ii. main and dip beam headlamps
iii. lighting and dip switch
iv. directional indicators
v. flash

b. The circuit diagram and operation of components for:

i. side and tail lamps
ii. headlamps
iii. direction indicators

c. The statutory requirements for motorcycle lighting when using a motorcycle on the road.
d. Headlamp adjustment and beam setting.

Auxiliary Systems

a. Function and construction of electrical components including:

i. anti theft devises
ii. horn
iii. heated grips
iv. power screen

b. The circuit diagram and operation of components for:
i. anti theft devises
ii. horn
iii. heated grips
iv. power screen

General

a. The preparation, testing and use of:
i. tools and equipment
ii. electrical meters and equipment used for dismantling
iii. removal and replacement of electrical and electronic systems and components

b. Appropriate safety precautions:
i. PPE
ii. motorcycle protection when dismantling
iii. removal and replacing electrical and electronic components and systems

c. The important of logical and systematic processes.

d. Preparation of replacement units for re-fitting or replacement electrical and electronic components and systems.

e. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance, safety requirements.

f. Refitting procedures.

g. The inspection and testing of units and systems to ensure compliance with manufacturer's, legal and performance requirements.

h. Inspection and re-instatement of the motorcycle following repair to ensure:
i. customer satisfaction
ii. cleanliness of motorcycle interior and exterior
iii. security of components and fittings
iv. re-instatement of components and fittings

i. Construction and operation of motorcycle auxiliary systems Auxiliary systems to include:-
i. Lighting systems
ii. security and alarm systems
iii. comfort and convenience systems
iv. information system
v. communication systems
vi. monitoring and instrumentation systems

Assessment Requirements

Unit MC04K – Knowledge of Motorcycle Chassis Units and Components

Content:

Steering

a. The action and purpose of steering geometry:
   i. castor angle
   ii. trail angle
   iii. wheel alignment

b. The following terms associated with steering:
   i. castor angle
   ii. trail angle
   iii. rake angle
   iv. wheel alignment

c. The components and layout of steering systems:
   i. handlebar
   ii. conventional steering head
   iii. leading link
   iv. bearings
   v. steering stem
   vi. yolk

d. The procedures used for inspecting the serviceability and condition of:
   i. conventional steering head
   ii. leading link

h. Steering system defects to include:
   i. uneven tyre wear
   ii. vi steering vibrations
   iii. wear in linkage
   iv. bearing failure
   v. damage linkage
   vi. excessive play
   vii. incorrect fork alignment
   viii. ix incorrect steering geometry

Suspension

a. The layout and components of suspension systems:
   i. conventional telescopic fork and tube
   ii. upside down telescopic fork and tube
   iii. hossack/Fior (Duolever) fork
   iv. springer fork
   v. leading link

b. The operation of suspension systems and components:

i. Convention telescopic fork and tube
ii. Upside down telescopic fork and tube
iii. Hydraulic damper
iv. Double swinging arm
v. Single swing arm
vi. Mono shock
vii. Adjustable damper
viii. Adjustable spring

c. The advantages of different systems including:
i. Convention telescopic fork and tube
ii. Upside down telescopic fork and tube
iii. Hydraulic damper
iv. Double swinging arm
v. Single swing arm
vi. Mono shock
vii. Adjustable damper
viii. Adjustable spring

d. The forces acting on suspension systems during braking, riding and cornering.

e. The methods of locating the road wheels against braking, driving and cornering forces.

g. Suspension terms:
i. rebound
ii. bump
iii. dive

h. The procedures used for inspecting the serviceability and condition of the suspension system

i. Suspension system defects:
i. wheel hop
ii. ride height
iii. wear
iv. noises under operation
v. fluid leakage
vi. excessive travel
vii. excessive tyre wear
viii. poor handling
ix. worn dampers
x. worn joints
xi. damaged linkages

Brakes

a. The construction and operation of drum brakes:
i. leading and trailing shoe construction
ii. drum designs
iii. cable
iv. hydraulic
v. self-servo action
vi. adjustment

b. The construction and operation of disc brakes:
i. disc pads
ii. calliper
iii. brake disc

iv. ventilated disc
v. disc pad retraction

c. The construction and operation of the hydraulic braking system:
   i. master cylinders
   ii. disc brake calliper & pistons
   iii. brake pipe
   iv. warning lights

d. The principles and components of electronic ABS systems, electrical and electronic components.

e. The requirements and hazards of brake fluid:
   i. boiling point
   ii. hygroscopic action
   iii. manufacturer's change periods
   iv. fluid classification and rating
   v. potential to damage paint surfaces

f. Terms associated with mechanical and hydraulic braking systems:
   i. braking efficiency
   ii. brake fade
   iii. ABS

g. The procedures used for inspecting the serviceability and condition of the braking system

h. Braking system defects:
   i. worn brake shoes or pads
   ii. worn or scored brake drums
   iii. worn or scored brake discs
   iv. abnormal brake noises
   v. brake judder
   vi. brake adjustments
   vii. fluid contamination of brake surfaces
   viii. antilock brake failure
   ix. fluid leaks
   x. poor braking efficiency
   xi. brake bind
   xii. brake grab
   xiii. brake fade

Wheel and Tyres

a. The construction of different types of tyre:
   i. radial
   ii. tread patterns
   iii. tyre mixing regulations
   iv. tyre applications

b. Tyre markings:
   i. tyre and wheel size markings
   ii. speed rating
   iii. direction of rotation
   iv. profile
   iv tread-wear indicators

c. Wheel construction:
   i. light alloy
   ii. wire wheels

iii. bearing arrangement
iv. roller ball
v. taper

d. The procedures used for inspecting the serviceability and condition of:
   i. tyres & wheels
   ii. bearings
e. The defects associated with tyres and wheels:
   i. abnormal tyre wear
   ii. cuts
   iii. side wall damage
   iv. wheel vibrations

General
The procedures for dismantling, removal and replacement of motorcycle chassis units, parts and system components
a. The preparation:
   i. testing and use of tools and equipment
   ii. electrical meters and equipment used for dismantling

b. Appropriate safety precautions:
   i. PPE
   ii. vehicle protection when dismantling
   iii. removing and replacing chassis motorcycle chassis units, parts and system components
c. The important of logical and systematic processes.

d. The inspection and testing systems and components.

e. The preparation of replacement units for re-fitting or replacement of motorcycle chassis units, parts and system components Identify the reasons why replacement components and units must meet the original specifications (OES):
   i. warranty requirements
   ii. to maintain performance
   iii. safety requirements

f. Refitting procedures.

g. The inspection and testing of units and systems to ensure compliance with manufacturer's, legal and performance requirements.

h. The inspection and re-instatement of the vehicle following repair to ensure customer satisfaction:
   i. cleanliness of motorcycle
   ii. security of components and fittings
   iii re-instatement of components and fittings

i. construction and operation of motorcycle steering and suspension systems
   a) conventional steering head
   b) leading link
   c) swinging arm
   d) single swing arm

j. key engineering principles that are related to motorcycle steering and suspension systems
   a) steering geometry

b). steering angles
c) hydraulic damping
d). stress and strain

k. key engineering principles that are related to motorcycle steering and suspension systems
   a) steering geometry
   b) steering angles
   c) hydraulic damping
   d) stress and strain

l. construction and operation of motorcycle braking systems
   a) cable
   b) hydraulic braking
   c) electronic ABS system

m. key engineering principles that are related to motorcycle braking systems
   a) laws of friction
   b) hydraulics
   c) properties of fluids
   d) braking efficiency

n. construction and operation of motorcycle wheels and tyres
   a) tyre construction
   b) tyre markings
   c) wheel construction

o. key engineering principles that are related to motorcycle wheel and tyre systems
   a) friction
   b) un-sprung weight
   c) dynamic and static balance

Assessment Requirements

Unit MC05K – Knowledge of Motorcycle Preparation and Inspections

Content:

Assembly, Pre and post work motorcycle inspections

a. PPE and motorcycle protection relating to:
   i. motorcycle body panels and frame
   ii. paint surfaces
   iii. polished surfaces
   iv. seats

b. Assembly, Pre and post work motorcycle inspection procedures:
   i. aural
   ii. visual and functional assessments on engine
   iii. engine systems
   iv. chassis systems
   v. wheels and tyres
   vi. transmission system
   vii. electrical and electronic systems
   viii. exterior motorcycle body panels and frame

c. The methods for carrying out inspections for: damage, corrosion, fluid leaks, wear, security, mounting security and condition to include;
   i. engines and engine systems
   ii. chassis systems
   iii. transmission systems
   iv. brakes
   v. steering
   vi. suspension
   vii. wheels
   viii. tyres
   ix. body panels and frame
   x. electrical and electronic systems and components
   xi. motorcycle seating and mirrors
   xii. motorcycle instrumentation
   xiii. driver controls

d. Check conformity to manufacturer's specifications and legal requirements.

e. Completion of documentation to include:
   i. inspection records
   ii. job cards
   iii. motorcycle records

f. Make recommendations based on results of motorcycle inspections.

g. The checks necessary to ensure customer satisfaction for:
   i. motorcycle body panels
   ii. paint surfaces
   iii. polished surfaces
   iv. chromed surfaces
   v. seats and mirrors

h. Prepare and use appropriate inspection equipment and tools.

i. Inspection procedures following inspection checklists.

j. various motorcycle preparation activities and inspections to include:-
   i. new motorcycle assembly
   ii. pre and post work
   iii. pre-delivery on new and used motorcycles
   iv. MOT test
   v. safety
   vi. post repair

Assessment Requirements

Unit MC07K – Knowledge of Diagnosis and Rectification of Motorcycle Engine Faults

Content:

Single cylinder and multi-cylinder fuel injection systems

a. The operation and construction of injection systems including:
   i. types of air flow/mass sensor
   ii. fuel supply system
   iii. fuel pump
   iv. filter
   v. fuel regulator
   vi. injectors
   vii. electronic control unit (ECU)
   viii. injector pulse width
   ix. sensors
b. The operation of each system under various operating conditions including:
   i. cold starting
   ii. warm up
   iii. hot starting
   iv. acceleration
   v. deceleration
   vi. cruising
   vii. full load
c. Engine speed limiting and knock sensing.

Engine Management

a. The function and purpose of engine management systems.
b. The difference between analogue, digital, programmable and non-programmable systems.
c. Open loop and closed loop control, types of input and output devices.
d. The function and operation of digital components and systems.
e. The operation of engine management systems under various conditions.

Valve Mechanisms

a. The reasons for variable valve timing and multi-valve arrangements and the effect on performance.
b. Layout of multi-valve arrangements, components, operation and drive arrangements.
c. Construction features and operation of variable valve timing engines and electronic control.

Terms Associated with Combustion

a. Flame travel, pre-ignition and detonation.
b. Fuel properties:
   i. octane rating
   ii. flash point
   iii. fire point
   iv. volatility
   v. composition of petrol fuels
   vi. hydro-carbon content
c. Composition of carbon fuels
d. Combustion process for spark ignition engines:

   i. air fuel ratio
   ii. lambda ratio
   iii. stoichiometric ratio

e. The by-products of combustion for different engine conditions and fuel mixtures:
   i. CO
   ii. CO_2
   iii. O
   iv. N
   v. H_2O
   vi. NOx

f. Describe the legal requirements for exhaust emissions;
   i. MOT requirements
   ii. EURO regulations

Assessment, Repair and Restoration of Mechanical Engine Components

a. How engine mechanical components are assessed and measured for wear and serviceability:
   i. cylinder bores
   ii. cylinder heads
   iii. crankshaft journals
   iv. valve faces
   v. valve guides
   vi. valve seats
   vii. camshafts

b The methods used for the repair and restoration of engine components.

Symptoms and Faults in Engine Mechanical Systems and Components

a. Symptoms and faults related to:
   i. worn cylinders
   ii. cylinder liners
   iii. pistons
   iv. piston rings
   v. crankshaft
   vi. camshaft
   vii. bearings
   viii. cylinder head and gasket
   ix. valves
   x. valve seats and valve guides
   xi. cambelts tensioned and pulleys
   xii. cam chains tension systems and guides
   xiii. lubrication system and components
   xiv. oil pump
   xv. relief valve
   xvi. filter
   xvii.

Diagnosis of Faults in Engine Mechanical Systems and Components

a. Interpret information for:
   i. diagnostic tests
   ii. manufacturer's motorcycle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. legal requirements

b. The preparation of tools and equipment for use in diagnostic testing and assessment.

c. Systematic assessment, testing and inspection of engine components and systems including:
   i. mechanical system & component condition
   ii. engine balance
   iii. power balance
   iv. performance and operation
   v. wear
   vi. run out
   vii. alignment
d. Use of appropriate tools and equipment including:
   i. compression gauges
   ii. leakage testers
   iii. cylinder balance tester
   iv. pressure gauges
   v. micrometers
   vi. vernier gauges
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with motorcycle manufacturer's specifications and settings.
g. The procedures for dismantling, components and systems and the use of appropriate equipment and procedures.
h. Assess, examine and measure components including:
   i. settings
   ii. values
   iii. condition
   iv. wear and performance of components and systems
i. Probable faults
   i. malfunctions
   ii. incorrect settings
   iii. wear
j. Rectification or replacement procedures.
   Evaluate operation of components and systems following diagnosis and repair to confirm system performance.

Faults and Symptoms in Ignition Systems

a. Ignition system failure or malfunctions including:
   i. no spark
   ii. misfiring
   iii. backfiring
   iv. cold or hot starting problems
   v. poor performance
   vi. pre-ignition
   vii. detonation
   viii. exhaust emission levels
   ix. fuel consumption
   x. low power
   xi. unstable idle speed

Faults and Symptoms in Electronic Petrol Injection Systems

a. Petrol injection system failures or malfunctions including:
   i. cold or hot starting problems
   ii. poor performance
   iii. exhaust emissions
   iv. high fuel consumption
   v. erratic running
   vi. low power
   vii. unstable idle speed

Faults and Symptoms in Petrol Carburetion Systems

i. cold or hot starting problems
ii. poor performance
iii. exhaust emissions
iv. high fuel consumption
v. erratic running
vi. low power
vii. unstable idle speed

Faults and Symptoms in Engine Management Systems

a. Engine management system failure or malfunctions including:
   i. misfiring
   ii. backfiring
   iii. cold or hot starting problems
   iv. poor performance
   v. pre-ignition
   vi. detonation
   vii. exhaust emission levels
   viii. fuel consumption
   ix. low power
   x. unstable idle speed

Diagnosis of Faults in Electronic Engine Management Systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. manufacturer's vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements
b. The preparation of tools and equipment for use in diagnostic testing and assessment.
c. Conduct systematic assessment, testing of engine systems including:
   i. component condition and performance
   ii. component settings
   iii. component values
   iv. electrical and electronic values
   v. system performance and operation
   vi. use of appropriate tools and equipment including gauges
   vii. multi-meter
   viii. breakout box
   ix. oscilloscope
   x. diagnostic tester
   xi. manufacturer's dedicated equipment
   xii. exhaust gas analyser
   xiii. pressure gauges
d. Evaluate and interpret test results from diagnostic testing.
e. Compare test result, values and fault codes with motorcycle manufacturer's specifications and settings.
f. The procedures for dismantling, components and systems using appropriate equipment.
g. Assess, examine and measure components including:
   i. settings

   ii. input and output values
   iii. voltages
   iv. current consumption
   v. resistance
   vi. output patterns with oscilloscope
   vii. condition
   viii. wear and performance of components and systems
h. Identify probable faults and indications of:
   i. faults
   ii. malfunctions
   iii. incorrect settings
   iv. wear
   v. values
   vi. inputs and outputs
   vii. fault codes
i. Rectification or replacement procedures.
j. Evaluation and the operation of components and systems following diagnosis and repair to confirm system performance.
   i. speed controls
   ii. control systems
k. Use of appropriate tools and equipment including:
   i. pressure gauges
   ii. multi-meter
   iii. breakout box
   iv. oscilloscope
   v. diagnostic tester
   vi. manufacturer's dedicated equipment
   vii. flow meter
l. Evaluate and interpret test results from diagnostic testing.
m. Compare test result, values and fault codes with motorcycle manufacturer's specifications and settings
n. How to dismantle, components and systems using appropriate equipment and procedures
o. How to assess, examine and measure components including: settings, input and output values, voltages, current consumption, resistance, output patterns with oscilloscope, pressures, condition, wear and performance of components and systems
p. Identification of probable faults and indications of faults, malfunctions, incorrect settings, wear, values, inputs and outputs, fault codes, pressures and leaks
q. Rectification or replacement procedures
r. Evaluation and operation of components and systems following diagnosis and repair to confirm system performance

Construction and operation of motorcycle engine systems to include:-

   a. engine mechanical
   b. lubrication systems
   c. fuel systems
   d. ignition systems
   e. cooling system
   f. air and exhaust systems
   g. engine management

Engineering principles that are related to motorcycle engine systems

   a. volumetric efficiency
   b. flame travel, pre ignition and detonation
   c. fuel properties
   d. composition of carbon fuels

e. combustion process
f. legal requirements for exhaust emissions

Symptoms and causes of faults found in motorcycle engine systems to include:

a. engine mechanical
b. lubrication systems
c. fuel systems
d. ignition systems
e. cooling system
f. air and exhaust systems
g. Engine management

Examine, measure and make suitable adjustments to the components including:

a. settings
b. input and output values
c. voltages
d. current consumption
e. resistance
f. output patterns with oscilloscope
g. pressures
h. condition
i. wear and performance

Assessment Requirements

Unit MC08K – Knowledge in Diagnosis and Rectification of Motorcycle Chassis Faults

Content:

Electrical and electronic principles of motorcycle chassis systems

a. The operation of electrical and electronic systems and components related to motorcycle chassis systems including:
    i. ECU
    ii. sensors and actuators
    iii. electrical inputs
    iv. voltages
    v. oscilloscope patterns
    vi. digital principles
b. The interaction between the electrical/electronic system and mechanical components of chassis systems.
c. Electronic and electrical safety procedures.

Operation of electronic ABS and traction control systems

a. Layout of:
    i. ABS and traction control systems
    ii. warning systems
b. Operation of:
    i. hydraulic and electronic control units
    ii. wheel speed sensor
    iii. hoses
    iv. cables and connectors
c. The relationship and interaction of braking with other motorcycle systems – traction control.

Steering geometry for motorcycle applications

a. Front/rear wheel geometry:

Symptoms and faults in braking systems

a. Symptoms and faults associated with braking systems:
    i. mechanical
    ii. hydraulic
    iii. electrical and electronic systems
    iv. fluid leaks
    v. warning light operation
    vi. poor brake efficiency
    vii. wheel locking under braking

Diagnosis and faults in braking systems

a. Locate and interpret information for:
    i. diagnostic tests
    ii. motorcycle and equipment specifications
    iii. use of equipment
    iv. testing procedures
    v. test plans
    vi. fault codes

vii. legal requirements

b. Prepare equipment for use in diagnostic testing.
c. Conduct systematic testing and inspection of:
   i. braking system
   ii. ABS
   iii. traction control
   iv. mechanical
   v. hydraulic
   vi. electrical and electronic systems
d. Using appropriate tools and equipment including:
   i. multi-meters
   ii. oscilloscope
   iii. pressure gauges
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with motorcycle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
i. Probable faults, malfunctions, incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with steering systems

a. Symptoms and faults associated with steering systems:
   i. mechanical
   ii. steering joints and bushes
   iii. bearings

Diagnosis and faults in steering systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. motorcycle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. legal requirements
b. How to prepare equipment for use in diagnostic testing.
c. Conduct systematic testing and inspection of:
   i. steering systems
   ii. mechanical
d. Using appropriate tools and equipment including:
   i. wheel alignment equipment
e. Evaluate and interpret test results from diagnostic testing.
f. Compare test result and values with motorcycle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the:
   i. operation
   ii. settings
   iii. values
   iv. condition and performance of components and systems
i. Probable faults, malfunctions, and incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Symptoms and faults associated with suspension systems

a. Symptoms and faults associated with suspension systems:
   i. mechanical
   ii. hydraulic
   iii. ride height
   iv. wear
   v. noises under operation
   vi. fluid leakage
   vii. excessive travel
   viii. excessive tyre wear

Diagnosis and faults in suspension systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. motorcycle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. legal requirements
b. How to prepare equipment for use in diagnostic testing.
c. How to conduct systematic testing and inspection of:
   i. suspension systems
   ii. mechanical
   iii. hydraulic
d. Using appropriate tools and equipment including:
   i. alignment equipment
s. Evaluate and interpret test results from diagnostic testing.
t. Compare test result and values with motorcycle manufacturer's specifications and settings.
u. How to dismantle, components and systems using appropriate equipment and procedures.
v. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
w. Probable faults, malfunctions and incorrect settings.
x. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Construction and operation of motorcycle chassis systems to include: -

a. Steering
b. Suspension
c. Anti-lock-braking system(ABS)
d. traction control
e. front and rear wheel geometry

Engineering principles that are related to motorcycle chassis systems

a. inertia force, mass and acceleration
b. laws of friction
c. static's
d. hydraulic machines

Examine, measure and make suitable adjustments to the components including:

a. settings
b. input and output values
c. voltages
d. current consumption
e. resistance
f. output patterns with oscilloscope

g. pressures
h. condition
i. wear and performance

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Assessment Requirements

Unit MC12K – Knowledge of Diagnosis and Rectification of Motorcycle Transmission and Driveline Faults

Content:

Electrical and electronic principles related to motorcycle transmission systems

a. The operation of electrical and electronic systems and components related to motorcycle transmission systems including:
    i. Control units
    ii. sensors and actuators
    iii. electrical inputs & outputs
    iv. voltages
    v. oscilloscope patterns
b. The interaction between the electrical/electronic system, and mechanical components of the transmission systems.
c. Electronic and electrical safety procedures.

The operation motorcycle clutches

a. The construction and operation of friction clutches (wet, and dry) including single and multi-plate clutch designs.

The operation of motorcycle transmissions and driveline systems

a. The construction and operation of manual gearboxes:
    i. gear arrangements
    ii. shaft and bearing arrangements
    iii. selector mechanisms
    iv. linkages
    v. lubrication
b. The construction and operation of automatic gearboxes and method for achieving different gear ratios.
c. Interaction between mechanical, electrical and electronic components
d. The construction and operation of continuously variable transmissions (CVT) and the benefits of this type of gearbox design.
e. The construction and operation of final drive systems including:
f. Chain and sprocket
g. Belt systems
    i. conventional crown wheel and pinion
h. The construction and operation of motorcycle hub arrangements.
i. The construction and operation of:
    i. drive shafts and couplings

Symptoms and faults in motorcycle transmissions and drive-line systems

a. Clutch and coupling faults:
    i. abnormal noises
    ii. vibrations
    iii. fluid leaks
    iv. slip
    v. judder
    vi. grab
    vii. failure to release
b. Gearbox faults:

   i. abnormal noises
   ii. vibrations
   iii. loss of drive
   iv. difficulty engaging or disengaging gears
   v. automatic gear box types
   vi. abnormal noises
   vii. vibrations
   viii. loss of drive
   ix. failure to engage gear
   x. failure to disengage gear
   xi. leaks
   xii. failure to operate
   xiii. incorrect shift patterns
   xiv. electrical and electronic faults
c. Final drive faults:
   i. abnormal noises
   ii. vibrations
   iii. loss of drive
   iv. oil leaks
   v. failure to operate
d. Drive-lines and couplings:
   i. abnormal noises
   ii. vibrations
   iii. loss of drive

Faults in motorcycle transmission systems

a. Interpret information for diagnostic tests, vehicle and equipment specifications, use of equipment, testing procedures, test plans, fault codes and legal requirements.
b. How to prepare equipment for use in diagnostic testing.
c. How to conduct systematic testing and inspection of transmission system, mechanical, hydraulic, electrical and electronic systems using appropriate tools and equipment including, mullet-meters,
d. How to carry out workshop based and road testing of vehicle and transmission system.
e. Evaluate and interpret test results from diagnostic and/or road testing.
f. Compare test result and values with vehicle manufacturer's specifications and settings.
g. How to dismantle, components and systems using appropriate equipment and procedures.
h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
i. Probable faults, malfunctions and incorrect settings.
j. Rectification or replacement procedures.
k. Operation of systems following diagnosis and repair to confirm operation and performance.

Construction and operation of motorcycle transmission and driveline systems to include:-

   a) clutches
   b) manual gearboxes
   c) automatics
   d) electronic control
   e) CVT (continuously variable transmission)
   f) Chain and sprocket
   g) Belt and pulley
   h) Drive shaft
   i) final drive unit
   j) hubs

Advanced engineering principles that are related to motorcycle transmission and driveline systems

a) friction
b) torque transmission
c) material
d) potential & kinetic energy

Symptoms and causes of faults found in motorcycle transmission and driveline systems to include: -

a) clutches
b) manual gearboxes
c) automatics
d) electronic control
e) CVT (continuously variable transmission)
f) Chain and sprocket
g) Drive shaft
h) final drive unit
i) hubs

Examine, measure and make suitable adjustments components including: -

a) settings
b) input and output values
c) voltages
d) current consumption
e) resistance
f) output patterns with oscilloscope
g) pressures
h) condition
i) wear and performance

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Assessment Requirements

Unit AE06MCK – Knowledge of Diagnosis and Rectification of Automotive Auxiliary Electrical Faults

Content:

The electrical principles that are related to motorcycle electrical circuits:

a. Ohms law
b. Voltage
c. Power
d. Current (AC and DC)
e. Resistance
f. Magnetism
g. Electromagnetism and electromagnetic induction
h. Digital and fibre optic principles
i. Electrical units and symbols
j. Electrical and electronic terminology
k. Relevant electrical safety

Charging

The operation of the motorcycle charging system:

i. alternator
ii. rotor
iii. stator
iv. slip ring
v. brush assembly
vi. three phase output
vii. diode rectification pack
viii. voltage regulation
ix. phased winding connections
x. cooling fan
xi alternator drive

Starting

a. The layout, construction and operation of engine starting systems:
b. The function and operation of the following components:

i. starter motor
ii. starter clutch mechanism
iii. pinion
iv. starter solenoid
v. clutch and gear safety switch
vi. ignition/starter switch
vii. stand switches
viii. starter relay (if appropriate)

Common faults and testing methods associated with charging and starting systems

i. fault code identification
ii. wiring faults
iii. component failure
iv. earth problems
v. sensor faults.

Lighting systems and technology

a. Lighting systems should include:
   i. Xenon lighting
   ii. gas discharge lighting
   iii. ballast system
   iv. LED
   v. intelligent front lighting
   vi. blue lights
   vii. complex reflectors
   viii. fibre optic
   ix. optical patterning

Lighting circuits and the relationship between each circuit

a. Circuits must include:
   i. sidelights
   ii. dipped beam
   iii. main beam
   iv. dim/dip

Common faults and testing methods associated with external lighting system

a. Fault diagnosis for:
   i. lighting systems failing to operate correctly
   ii. switches
   iii. relays
   iv. bulbs failing to operate

The operating principles of external lighting systems and multiplexing systems

a. To include all external lighting systems and a good knowledge of multiplexing systems.

The different types of auxiliary electrical components

a. Components should include:
   i. heated grip
   ii. electrically operated screens
   iii. horn
   iv. multi-functional switches
   v. relays
   vi. heated mirrors

Common faults and testing methods associated with heated mirror systems

a. Faults must include:
   i. screen elements not operating
   ii. timer relays not operating and staying on permanently

The different types of entertainment and information systems and components

a. Systems and components must include:
   i. radio CD and multi play units
   ii. MP3 players
   iii. speakers
   iv. aerial systems
   v. amplifiers
   vi. Satellite Navigation
   vii. communication units

Common faults and testing methods associated with entertainment and information systems

a. Faults to include:
   i. entertainment and navigation units not operating
   ii. speaker, aerial and amplifier systems not functioning correctly
   iii. excessive radio interference (suppression)
   iv. use of diagnostic computers and systems

The different types of integrated security/warning systems and components

a. Components to include:
   i. control units
   ii. alarm modules
   iii. audible warning units
   iv. immobiliser units
   v. sensing units
   vi. horn
   vii. audible warning speakers

The function of component parts in integrated security and warning systems

a. Components to include
   i. control units
   ii. alarm modules
   iii. audible warning units
   iv. immobiliser units
   v. relays
   vi. diodes
   vii. horns

The relevant legislation relevant to security and warning systems

a. Find and apply all relevant legislation for the fitment and use of security and warning systems.

Common faults and testing methods associated with security and warning systems

a. Components to include:
   i. control units
   ii. audible warning units
   iii. immobiliser units
   iv. horns
   v. relays
   vi. diodes
   vii. wiring
   viii. connections and protection devices
   ix. removal and refitting procedures
   x. using computer diagnostics to identify faults
   xi. use of manufacturers diagnostic equipment

How to examine, measure and make suitable adjustments to components are:

a. Settings
b. Input and output values
c. Voltages
d. Current consumption
e. Resistance

f. Input and output patterns with oscilloscope (including frequency and duty cycle measurements)
g. Condition
h. Wear and performance

How to select, prepare and use diagnostic and rectification equipment for motorcycle auxiliary electrical systems:

a. Voltmeters
b. Ammeters
c. Ohmmeters
d. Multi-meters
e. Battery testing equipment
f. Dedicated and computer based diagnostic equipment
g. Oscilloscopes