Automobile Technology (AT)
Paper-I

Theory – 40
Practical - 60

- **TOOLS USAGE**
- **2 WHEELERS ENGINE DISMANTLING FROM VEHICLE (AUR102)**
- **2 WHEELER ROUTINE MAINTENANCE CHECKS (AUR 102, AUR 203)**

Unit.I

- General health & Safety precautions to be observed in the workshop/garage
- Overview on 5S technic (Sort, Set in order, Shine, Standardise & Sustain) – advantages in Implementation of 5S
- Nomenclature of different parts of vehicle and their locations
- Working principle of 4 stroke petrol & diesel engines
- Differences between petrol & diesel engines
- Lubrication and cooling system and types of lubricants
- Lay out of greasing points
- Torqueing & detouring technique/procedures
- Fuel supply layouts in both petrol & diesel engines
- Layouts of power flow from engine to wheels
- Ignition system circuit & components
- Brief introduction on ignition & injection systems
- Brief introduction on injectors
- Purpose of clutch, gear box & differential
- General defects in clutch, manual gearbox
- Types of brake & steering systems – working principle of drum and disc brakes
- General defects in brake systems
- Brief introduction on battery and its maintenance
- Tyre designation (size), reasons for general tyre defects
- Procedure for repairing the punctured tube
- Need & procedure for tyre rotation

Unit.II

- Knowledge on health & safety
- Procedure for checking compression pressure
- Procedure for dismantling engine
- Valve/port timing diagram of 2 stroke engine
- Air-fuel ratio at different conditions,
- Knowledge on micrometer, feeler gauge & dial gauges
- Procedure for dismantling, inspecting/component checks, assembling, engine & transmission system (overhauling of an engine & transmission)
- Do & don't during over hauling of engine
- Procedure for dismantling, checking, assembling & adjustments of carburetor
- Procedure for overhauling transmission, brake & suspension systems
- Emission norms, emission control components & their working principles

- Procedure for handling & using multi-meter
- Fundamental electrical principal
    - Ohm's Law
    - Series & Parallel resistances circuits
    - induction
- Working principle of Ignition system
- Procedure for checking & overhauling starting system
- Procedure of checking & overhauling charging system
- Procedure for checking & overhauling suspension system
- Procedure for testing the engine

- **TOOLS USAGE**
- **3 WHEELERS ENGINE DISMANTLING FROM VEHICLE (AUR206)**
- **3 WHEELER ROUTINE MAINTENANCE CHECKS (AUR 206)**

Unit.III

- Knowledge on safety practices
- Reading of workshop manual
- Procedure for checking compression pressure
- Do's & don'ts during dismantling & assembling the engine
- Valve timing of 4 stroke petrol engine & single
- Cylinder diesel engine
- Working principle of diesel injection pump and injector of a single cylinder engine
- Procedure for reading micrometer & dial gauges
- Procedure for overhauling of an engine & transmission
- Usage of the multimeter

Unit.IV

- Fundamental electrical principles
    - Ohm's Law
    - Series & Parallel resistances circuits
    - Working principle, application & checking of transistors,
- Wiring colour-code,
- Fault finding procedure in ignition system
- Working principle of starter motor & alternator
- Working principle of constant mesh gear box
- Electronic ignition system
- Charging system circuit, system components overhauling & testing
- Working principle & procedure for overhauling of brakes
- Bearing-types (available in 3 wheelers cycles), procedure for handling, assembling & dismantling
- Purpose & function of shock absorber
- Procedure for overhauling a shock absorber
- Latest emission norms
- Latest emission controls available to meet the norms & their working principle

Practical

- Practice Health & Safety –familiarize, select, use, maintain & store tools, equipments, consumables & clothing safely

- Practice 5S technic
- Identify/familiarize with the tools & equipments
- Water wash – before & after servicing
- Check/replenish/top up – lubricating oil, brake fluid, engine coolant, power steering, hydraulic oil, wind screen wiper water, battery electrolyte and transmission oil
- Clean/replace – air cleaner, oil filter & fuel filter
- Apply grease to parts/through greasing points
- Remove & refit vehicle body parts (bonnet, front bumper & door)
- Remove and refit head lamp assembly
- Check power plug and inspect H.T. cables
- Clean, check and adjust spark plug
- Adjust hand brake and replace hand brake cable
- Adjust clutch and brake pedal plays
- Replace propeller shaft, wheel hub bearings & brake pads
- Charge the battery
- Check tyre pressure & for defects, tread depth, inflate, rotate the tyres
- Practice Health & Safety – select, use, maintain & store tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids & asbestos safely
- Identification of tools, measuring instruments & equipments used for the trade
- Measure any components by using the micrometer & dial gauge (practice)
- Remove broken stud
- Dismantle, clean, check, assemble and adjust carburetor
- Clean intake and exhaust system
- Test ignition system, find faults & rectify
- Check compression pressure & take decision for next action
- Dismantle, inspect components, rectify/replace and assemble engine & transmission
- Measure cylinder bore-ovality, taper, wear & take decision for next action
- Check valve leak, valve bend and valve lapping
- Overhaul brake & suspension system
- Replace chain/links, sprocket & adjust chain tension
- Dismantle, check & assemble wheel bearings & steering column bearing
- Check & repair self-starter and starting system
- Check & repair charging system components
- Check voltage, continuity and resistance in electrical systems
- Rectify defects in lightning system
- Check battery condition, prepare electrolyte, top up & maintain battery
- Check speedometer & rectify the defect
- Fine tune the engine and road test the vehicle
- Practice health & safety – select, use, maintain & store – tools, equipments & clothing safely. Handle fuels, oils, lubricants, acids, alkails, adhesives, seals, solvents, gases & asbestos safely
- Water wash & clean the vehicle
- Remove broken stud
- Check compression pressure
- Clean fuel tank
- Dismantle, clean, check engine components & assemble
- Dismantle, clean, reset, fit & fine tune carburetor
- Overhaul and test fuel injection pump
- Test injector & repair the defect

- Set valve timing
- Set ignition/injection timing
- Dismantle, clean, check, repair and refit clutch & gear box
- Lubricate and grease the vehicle
- Prepare electrolyte & charge the battery
- Check voltage, resistance, continuity and find fault in electrical circuits & rectify
- Dismantle, clean, check, repair and assemble 0 starter motor & starting system
- Dismantle, clean, check, repair and reassemble – alternator/ charging system
- Check voltage regulator
- Dismantle wheel bearing, steering stem & ball race, inspect & assemble
- Overhaul disc & drum brakes systems
- Replace front fork oil/oil seals
- Check the working condition of emission control devices
- Do fine tuning, test, rectify the vehicle defects

Paper-II

Theory – 40
Practical - 60

- **TOOLS USAGE**
- **4 WHEELERS ENGINE DISMANTLING FROM VEHICLE (AUR101)**
- **ENGINE CONTROLS FUEL INJECT, SENSORS (AUR 101)**

Unit.I

- Knowledge on health & safety precautions to be observed in the workshop / garage (health hazard of asbestos dust to be emphasized)
- Familiarization of workshop manual

Unit.II

- Power flow from engine to wheels
- Units & Definition of force, work, power, torque & pressure
- Description of single plate clutches. Functions of different parts of the clutch assembly. Clutch
  linings material. Power flow in clutch plate.
- Clutch operating mechanisms- manual & hydraulic
- Clutch faults
- Type of gears and their application-advantages and disadvantages-gear ratio
- Types of gear box
- Working principle of constant mesh, synchromesh gear boxes
- Gear selection mechanism
- Lubrication of transmission system
- Gear box faults
- Types of bearings, maintenance, their characteristics & application
- Working principle of constant velocity joints
- Working principle of differential
- Faults in differential & C.V. Joints

Unit.III

- Forces & moments acting on vehicle, brake slip, braking force co-efficient, time element of braking operation
- Classification of brake systems, factors affecting the braking distance
- Advantages of hydraulic brake system over pneumatic
- Working principle of brake components – brake booster tandem master cylinder, caliper assembly, wheel cylinder & different braking force control valves
- Brake linings, pads & fluid
- Brake faults diagnostic
- Introduction to anti-lock braking system (ABS).

Unit.IV.

- **STEERING –** Introduction, basic types of steering, steering geometry (necessity, types & effects), steering characters (over steer, under steer & neutral steer) & steering linkage
- Types of steering gear, power assisted steering (hydraulic & electronic)

- Checks on steering system and fault diagnosis
- **SUSPENSION –** Introduction, requirement, types, McPherson strut, shock absorber,
- Checks on suspension system and fault diagnosis
- Necessity, functions, designation & defects analysis
- Procedure for tyre rotation
- Fundamental electrical principles
    - Ohm"s Law
    - Series & Parallel resistances circuits
    - Working principle, types & application of – capacitors & transistors,
- Usage of multimeter
- Wiring colour-code, reading of engine electrical systems circuits
- Fault finding in electrical circuits
- Final road test procedure – observation of Noise,
- Vibration & harshness from different part of chassis – observation of transmission, brake, clutch, steering & suspension systems for their satisfactory working

Practical:

- Practice Health & Safety –familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely
- Identify different parts of chassis
- **R**emove clutch plate from vehicle, check for defects & rectify/replace & refit
- Remove gear box from vehicle, dismantle, check, rectify, fill lubricating oil & assemble
- Align gear selector fork
- Remove CV Joint, Dismantle, lubricate & refit
- Remove crown wheel, pinion and bearings, clean parts.
- Check tooth contact in the crown and pinion and adjust backlash & Assemble rear axle assembly
- **C**heck and adjust parking brake and service brakes.
- Dismantle wheel brake assembly– remove old lining and fit new one
- Remove and refit vacuum boosters
- Overhaul – master cylinder, Wheel cylinder & caliper pistons, wheel drum
- Bleed vacuum assisted hydraulic brakes
- Remove & clean brake drums.
- Check disc/drum run- out, Fit new cups and brake hoses –assemble, adjust all four-wheel brakes and test for brake concern.
- **C**heck and correct the steering geometry with instruments
- Remove and refit steering boxes from vehicle, checking and top up oil in steering box.
- Check and adjust steering wheel play andbacklash.
- Overhaul hydraulic power assisted steering system –pump, control valve & cylinder
- **R**emove and refit a leaf spring as an assembly in a vehicle, changing rubber bushes of shock absorbers and independent front suspension.
- Lubricate suspension units.
- Re-camber the leaf spring
- **R**emove tyre, inspect/check & assemble
- Rotate the tyres
- **R**emove and refit head lamp
- Check for electrical defects and rectify
- Do Final road test – observe for Noise,
  Vibration & harshness from different part of chassis – observe for problems in transmission, brake, clutch, steering & suspension systems & rectify the defect.