Vocational Curriculum – 2012
(With effect from the academic year 2012-2013)

Curriculum of Intermediate Vocational Course
In
AUTOMOBILE ENGINEERING TECHNICIAN

State Institute of Vocational Education
O/o the Commissioner of Intermediate Education,
Andhra Pradesh, Hyderabad

&

Board of Intermediate Education,
Andhra Pradesh, Hyderabad
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1. Introduction

Automobile Industry is one of the most important and rapidly growing industries in the world. In India, it is bound to become one of the major industries. Day by day the number of vehicles are increasing on the road as per the public need. More and latest luxurious vehicles are being introduced by the multinational companies to our country. In India there are quite a number of companies producing different motor vehicles both light and heavy, two, three and four wheeler. Hence a large number of persons apart from automobile engineers are responsible for the design, planning, production and sale of vehicles. Craftsmen as well as a large number of middle level technicians are required on the shop floor. Hence there is dire need of middle level technicians to the rapidly growing automobile industry for servicing, repair and maintenance of the automobile. So this gap can be fulfilled through the vocational education at +2 level by training the youth in this course.

And also the growing importance for good maintenance and timely servicing of vehicle leads to cut in carbon emission and to keep the vehicle pollution levels within the prescribed limits set by the Transport Authorities. The skill and techniques acquired during the course develops the required competency in performing the job effectively whether one is placed in a waged or self employment.

This is the reason behind the competency based vocational curriculum developed by State Institute of Vocational Education, O/o the Commissioner of Intermediate Education, Andhra Pradesh, Hyderabad & Board of Intermediate Education, Andhra Pradesh, Hyderabad.
II. Objectives of the Course

1. To know about the use of various hand tools, gauges, instruments and special equipment.
2. To know the constructional features and functions of engine, clutch, gear box, propeller shaft, differential and rear axle, brakes, steering and steering linkages, front axle, front suspension, rear suspension, Chassis.
3. To know the constructional features and functions of fuel injection pumps and feed pump.
4. To know about the properties and use of lubricating oil and maintenance schedule.
5. To know about servicing, minor engine tune-up and major engine tune-up.
6. To know traffic signs.
III. Skills to be provided

1. Should be able to use various hand tools, gauges, instruments and Special equipment.

2. Should be able to wash, clean the under chassis and to lubricate the various points.

3. Should be able to implement the maintenance schedule.

4. Should be able to check the tightening of nuts as per the required torque

5. Should be able to overhaul the engine, clutch, propeller shaft, gear box, rear axle, front axle steering assembly, suspension, braking system [Petrol & Diesel vehicles]

6. Should be able to overhaul fuel injection pump, feed pump, and injectors.

8. Should be able to perform tyre rotation and repair.

9. Should be able to repair electrical system.

10. Should be able to mount the wheels.

11. Should be able to carry out servicing, minor and major engine tune up.

12. Should be able to test the engine on dynamometer
IV. JOB OPPORTUNITIES

a) Wage Employment

1. Auto Mechanic
2. Vehicle Service Technician
3. Auto Fitter in Manufacturing Concern in Assembly Shop or
4. Spare Parts Sales Assistant / Manufacturers’ Representative
5. Insurance Agent and Assistant to Loss Assessor
6. Laboratory Assistant
7. Auto Electrician

b) Self Employment

11. Automobile Mechanic
12. Diesel Fuel System Service Mechanic
13. Vehicle Operator
14. Spare Parts Salesman
15. Spare Parts Dealer
V. SCHEME OF INSTRUCTION AND EXAMINATION

I ANNUAL SCHEME OF INSTRUCTION AND EXAMINATION FOR 1ST YEAR AUTOMOBILE ENGINEERING TECHNICIAN

<table>
<thead>
<tr>
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<th>Theory</th>
<th>Practicals</th>
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<tr>
<td>course</td>
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</tbody>
</table>

Part-B

| 3. Paper-1      | 135     | 50         | 135    | 50    | 270     | 100   |
| Work Shop       |         |            | Paper -I Workshop Practice |        |       |
| Technology      | 135     | 50         |        |       |         |       |

| 4. Paper-II     | 135     | 50         | 135    | 50    | 270     | 100   |
| Basic           | 135     | 50         |        |       |         |       |
| Mechanical      | 135     | 50         | Paper - II Engineering Drawing and Auto CAD. | 135    | 50    | 270     | 100   |
| and Electrical  |         |            | 135    | 50    | 270     | 100   |
| Engineering.    |         |            |        |       |         |       |

| 5. Paper-III    | 135     | 50         | 135    | 50    | 270     | 100   |
| Auto Power      | 135     | 50         |        |       |         |       |
| Plant           | 135     | 50         | Paper –III Automobile Engine lab. | 135    | 50    | 270     | 100   |
| 6. OJT          | -       | -          | -      | -     | -       | -     |
| Total           | 705     | 250        | 770    | 250   | 1475    | 500   |

II. II YEAR AUTOMOBILE ENGINEERING TECHNICIAN

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<tr>
<td>course</td>
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Part-B

| 3. Paper-1      | 110     | 50         | 115    | 50    | 225     | 100   |
| Auto            | 110     | 50         | Paper-1 Auto Transmission & Electrical System Lab | 115    | 50    | 225     | 100   |
| Transmission &  |         |            |        |       |         |       |
| Electrical      | 110     | 50         | Auto Transmission & Electrical System Lab | 115    | 50    | 225     | 100   |
| Systems.        | 110     | 50         |        |       |         |       |

| 4. Paper-II     | 110     | 50         | 115    | 50    | 225     | 100   |
| Auto            | 110     | 50         | Paper-II Auto Chassis and Body Engineering Lab | 115    | 50    | 225     | 100   |
| Chassis         | 110     | 50         | Auto Chassis and Body Engineering Lab | 115    | 50    | 225     | 100   |
| and Body        |         |            |        |       |         |       |
| Engineering.    |         |            |        |       |         |       |

| 5. Paper-III    | 110     | 50         | 115    | 50    | 225     | 100   |
| Auto            | 110     | 50         | Paper-III Auto Servicing & Maintenance Lab. | 115    | 50    | 225     | 100   |
| Servicing &     |         |            |        |       |         |       |
| Maintenance.    |         |            |        |       |         |       |

| 6. OJT          | -       | -          | -      | -     | -       | -     |
| Total           | 630     | 250        | 795    | 250   | 1425    | 500   |
| Total           |         |            |         |       |         | 1000  |
SYLLABUS

FIRST YEAR SUBJECTS

THEORY

1. WORK SHOP TECHNOLOGY
2. BASIC MECHANICAL AND ELECTRICAL ENGINEERING
3. AUTO POWER PLANT

PRACTICAL

1. WORKSHOP PRACTICE
2. ENGINEERING DRAWING AND AUTO-CAD
3. AUTOMOBILE ENGINE LAB

ON THE JOB TRAINING

SECOND YEAR SUBJECTS

THEORY

1. AUTO TRANSMISSION AND ELECTRICAL SYSTEMS
2. AUTO CHASSIS AND BODY ENGINEERING
3. AUTO SERVICING AND MAINTENANCE

PRACTICAL

1. AUTO TRANSMISSION AND ELECTRICAL SYSTEMS LAB
2. AUTO CHASSIS AND BODY ENGINEERING LAB
3. AUTO SERVICING AND MAINTENANCE LAB
## AUTOMOBILE ENGINEERING TECHNICIAN
### WORK SHOP TECHNOLOGY
#### THEORY PAPER-1, 1 YEAR

<table>
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<th>Long Questions</th>
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<td>2</td>
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<td>Sheet Metal Work</td>
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<td>7</td>
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<td>Lathe Machine And Grinding</td>
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<td><strong>68</strong></td>
<td><strong>10</strong></td>
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AUTOMOBILE ENGINEERING TECHNICIAN
THEORY PAPER – I, I YEAR
WORKSHOP TECHNOLOGY

Unit 1: Engineering materials.

Unit 2: Fitting and Drilling
Checking & Measuring Instruments Calipers & Dividers Drilling Machines - Sensitive and Radial Drilling Machines Various Fitting and Drilling operations

Unit 3: Sheet Metal Work

Unit 4: Carpentry

Unit 5: Forging & Welding

Unit 6: Foundry
Contents: Advantages and limitations of Casting, foundry equipment Hand moulding Tools, Moulding Boxes, Types of sands and properties. Patterns : Classification & Making; Cores & Core making Casitngs : Green sand and dry sand moulding, Shell Moulding, ceramic moulding, Special castings, Defects in castings.

Unit 7: Mechanical Working of Metals

Unit 8: Lathe & Grinding
Contents: Lathe main parts, simple operations, Grinding – working principle; Grinding wheel materials, Applications of Grinding.
AUTOMOBILE ENGINEERING TECHNICIAN  
PRACTICAL - PAPER - I  
1 YEAR  
WORKSHOP PRACTICE

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<td>4</td>
<td>Black Smith</td>
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</table>
Detailed Syllabus:

1. **Fitting:**
   - 1.1. Identification & Usage of tools
   - 1.2. Sawing Practice
   - 1.3. Filing practice
   - 1.4. Chiseling Practice
   - 1.5. Preparation of 'T', ‘L’ Sections
   - 1.6. Drilling
   - 1.7. Tapping

2. **Tin Smithy**
   - 2.1. Make a Rectangular tray
   - 2.2. Make a Rectangular Scoop, Funnel
   - 2.3. Riveting practice
   - 2.4. Soldering the joints
   - 2.5. Elbow

3. **Carpentry**
   - 3.1. Planning practice
   - 3.2. Chiseling practice
   - 3.3. Prepare Tee Lap joint
   - 3.4. Plain Tenon joint
   - 3.5. Mortise & Tenon joint
   - 3.6. Boring Practice

4. **Black Smithy**
   - 4.1. Practicing of usage of tools
   - 4.2. Making a round bar from a square bar
   - 4.3. Making a ring of given round rod
   - 4.4. Making of crane hook, S-hook, T-bolt, Flat Chisel, Gib head, sunk key

5. **Welding :**
   - a) **Arc welding**
     - 5.1. Make a square butt joint
     - 5.2. Making of T joint, lap joint, corner joint
     - 5.3. Identification of welding positions
   - b) **Gas welding**
     - 5.4. Identification of Gas welding equipment
     - 5.5. Setting of Gas welding equipment
     - 5.6. Setting of Gas welding flames
     - 5.7. Practicing of Gas welding techniques
AUTOMOBILE ENGINEERING TECHNICIAN
BASIC MECHANICAL & ELECTRICAL ENGINEERING
THEORY PAPER - II, I YEAR

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<td><strong>68</strong></td>
<td><strong>10</strong></td>
<td><strong>8</strong></td>
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1.0. Fundamentals of Thermodynamics
1.1 Definition for system, boundary, surroundings, working fluid and state of system
1.2. Types of thermodynamic systems, closed, open and isolated systems with examples
1.3. Properties of systems intensive and extensive with examples
1.4. Definitions for properties like pressure, volume, temperature, enthalpy, internal energy and their units.
1.5. Definitions for flow of work and specific heat

2.0 Laws of perfect Gases
2.1. Explanation of gas laws, Boyle's law, Charles’s law, Avogadro’s law, Joule's law and Renaults law.
2.2. Characteristic gas equation, universal gas equation, characteristic gas constant, universal gas constant.
2.3. Specific heat at constant pressure and constant volume for a gas. Relation between two specific heats with characteristic gas constant
2.4. Simple problems on gas equations.

3.0 Laws of thermodynamics:
3.1. Zeroth, first, second laws of thermo dynamics, simple problems on conversion of heat into work.

4.0 Thermodynamic processes:
4.1. Types of thermo dynamics processes, Constant volume, Constant pressure, isothermal, Adiabatic, polytrophic, equations, representing the processes
4.2. Equations for work done during the processes, calculation of change of internal energy.
4.3. Calculation of heat supplied or rejected during the processes

5.0. Fuels
5.1. Definition of fuels, types of fuels, solid, liquid and gaseous fuels and its uses
5.2. Calorific values (Higher & lower) of fuels
5.3. Fuels used in I.C. Engines
5.4. Qualities of good fuel
5.5 octane number
5.6. Cetane number
5.7 Alternative fuels

6.0. Thermo dynamic cycles
6.1. Carnot Cycle
6.2. P-V & T-S diagram
6.3. Working of carnot cycle
6.4. Assumption of carnot cycle
6.5. Efficiency of carnot cycle (without proof)
6.6. Otto cycle
6.7 Working.
6.8. P-V and T-S Diagrams
6.9. Efficiency of Otto cycle without proof
6.10. Diesel cycle
6.11. Working
6.12. P-V and T-S Diagrams
6.13. Efficiency of Diesel cycle without proof
7.0. Introduction to Transmission of Power
7.1. Types of transmission of power in Engineering
7.2. Power transmitting media like belt, Chain, rope and gears
7.3. Expression for velocity ratio for belts (formula only)
7.4. Definition of the slip
7.5. Belt drives, open and cross belt drive
7.6. Tensions in tight and slack sides of a belt
7.7. Rope drive, chain drive, gear drive, simple gear drive and compound gear drive and their applications.
7.8. Belt fastener.
7.9. Uses of Jockey pulley

8.0. Fasteners
8.1. Introduction
8.2. Screws
8.3. Nuts and Bolts
8.4. Rivets and Clamps

9.0. Units of Mechanical work, power and Energy
9.1. Definition of work, power and energy with S.I. units
9.2. Simple problems on work, power and energy

10.0. Safety Precautions
10.1. Precaution in handling tools
10.2. Causes of Electric shocks
10.3. Cure of electric shock-first aid, artificial respiration
10.4. Precaution against shock

11.0. Electric Current; Ohm’s Law; Kirchhoff’s laws
11.1. Electric Current, Voltage
11.2. Conductors, Semi-Conductors, Insulators
11.3. Conventional, Electric Current Flow Unit
11.4. Idea of Electric Potential unit
11.5. Definition Electrical Resistance Unit
11.6. Definition Specific Resistance Unit
11.7. Calculation of Resistance of conductor
11.8. Simple problems
11.9. Effect of temperature on resistance
11.10. Temperature co-efficient of resistance
11.11. Ohm’s law and resistance calculations
11.12 Resistance in series and parallel combinations
11.13. Kirchoff’s laws
11.14 Kirchhoff’s current & voltage laws
11.15 Electrical work, power & energy

12.0. Electrical measuring Instruments
12.1. Classification of electrical measuring instruments
12.2. Ammeters and voltmeters and their applications
12.3. Moving coil meters and moving iron
12.4. Method of connecting the Ammeters and Voltmeters
12.5. Wattmeter
12.6. Energy Meter
12.7. Power Factor Meter
12.8. Megger
12.9. Continuity tester
12.10. Measurement of Insulation resistance
## AUTOMOBILE ENGINEERING TECHNICIAN

### ENGINEERING DRAWING

**PRACTICAL - PAPER – II,**

**1st YEAR**

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<td>6</td>
<td>Sections of Solids</td>
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<td></td>
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<td><strong>135</strong></td>
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Detailed Syllabus

1.0. Introduction
1.1. Scope and objective of the subject
1.2. Importance of engineering drawing as a communication medium
1.3. Drawing instruments and their uses
1.4. Scales : Recommended scales, reduced & enlarged
1.5. Sheet sizes : A0, A1, A2, A3, A4, A5. Layout of drawing sheet sizes of title block and its contents
1.6. Simple exercises on the use of drawing instruments.

2.0. Lettering and Dimensioning
2.1. Types of Lettering
2.2. Guide Lines for lettering
2.3. Recommended sizes of letters and numbers
2.4. Single stroke letters.
2.5. Dimensioning - rules and systems of dimensioning - dimensioning a given drawing

3.0 Geometric Construction
3.1. Bisecting a line - perpendiculars - parallel lines - division of a line
3.2. Angles - bisection, trisection
3.3. Tangent lines touching circles internally and externally
3.4. Polygons - Regular polygons - circumscribed and inscribed in circles.
3.5. Conic sections - Definitions of focus, directrix, eccentricity
   (i) Construction of Ellipse by Concentric circles method.
   (ii) Construction of parabola by rectangular method.
   (iii) Construction of Hyperbola when given the position of point from X-axis and Y-axis.

4.0 Orthographic Projection
4.1. Definition - Planes of Projection - Four quadrants – Reference line.
4.2. First angle projection - Third angle projection
4.3. Projections of points
4.4. Projections of straight lines
4.5. Projections of planes
4.6. Projections of solids
4.7. Conversion of pictorial views into orthographic views

5.0. Isometric Projection
5.1. Definition - Isometric axes, lines and planes
5.2. Isometric Scale - Isometric view
5.3. Drawing of isometric views of plane figures
5.4. Drawing of isometric views of prisms and pyramids
5.5. Drawing of isometric view of cylinders and cones

6.0. Sections of Solids
6.1. Need for drawing sectional views - section planes - true shape of a section
6.2. Sections of prisms and pyramids
6.3. Sections of cones and cylinders.

7.0 Auto –CAD
7.1 Study of Auto-CAD screen, toolbars, menus and various commands
7.2 Exercise on mirror imaging, rotate, array and move commands
7.3 Exercise on dimensioning and hatching
7.4 Exercise on 2D drawings
7.5 Study the 3D solids and solid tool bar options
7.6 Draw bolt and nut in 3D drawings
# AUTOMOBILE ENGINEERING TECHNICIAN
## AUTOMOBILE POWER PLANTS
### THEORY - PAPER – III, 1 YEAR

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Major Unit</th>
<th>No. of Periods</th>
<th>Weightage</th>
<th>Short Questions</th>
<th>Long Questions</th>
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<td>8</td>
<td>Manifolds &amp;Mufflers</td>
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<td>Performance of I.C. Engines</td>
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<td><strong>68</strong></td>
<td><strong>10</strong></td>
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</table>
1. Introduction to Engines
1.1. Definition of Engine
1.2. Types of Engines
1.3. Function of I.C. Engines
1.4. Classification of I.C. Engines

2. Petrol Engines
2.1. Material used, function and constructional details of Petrol Engine components
2.2. Cylinder arrangement (in line, V-type, opposed-piston, opposed Cylinder, radial) of Petrol Engines
2.3. Construction and working of 2 stroke and 4 stroke petrol engines
2.4. Side valve and overhead valve operating mechanism, L, I, F, and T type valve arrangements, valve clearance, timing gears
2.5. Comparison between 2 stroke and 4 stroke petrol engines
2.6. Valve timing diagram of 2 stroke and 4 stroke petrol engines
2.7. Firing order of multi cylinder engine

3. Petrol Engine Fuel System
3.1. Line diagram of petrol engine fuel system
3.2. Constructional details of fuel tank, fuel lines
3.3. Construction and working of fuel pumps
3.4. Requirements of an automobile carburetor
3.5. Air fuel ratios for different conditions
3.6. Arrangement of carburetors-down draught, up draught and side draught
3.7. Construction and working of Carter, Zenith, Solex and S.U. Carburetors
3.8. Petrol injection system in Modern Vehicles
3.9. Working principle of a super charger, scavenging

4. Diesel Engines
4.1. Working principle of a 2 stroke and 4 stroke diesel engines
4.2. Valve timing diagram of 2 stroke and 4 stroke diesel engines
4.3. Advantages and limitation of diesel engine over a petrol engine
4.4. Types of diesel engine combustion chambers i.e. direct injection Chamber, pre combustion chamber and turbulence chamber-Relative advantages and disadvantages

5. Diesel Engine Fuel System
5.1. Line diagram of diesel engine fuel system
5.2. Types of diesel fuel feed pump-construction & working
5.3. Requirements of fuel injection system
5.4. Types of fuel injection systems-Common Rail, Individual System
5.5. Construction & working of F.I.P.
5.6. Governing System Function - construction & working of Mechanical & pneumatic type governors
5.7. Function of Injectors-Types of injectors and their construction & working.-Single hole, Multihole, & Pintlehole

6. Lubrication System
6.1. Types of lubricants
6.2. Properties of lubricants & SAE number
6.3. Requirements of lubrication for Automobiles
6.4. Construction & working of different types of lubrication systems
   i.e. Petroil (or) mist type, splash type, forced feed type and dry sump type

6.5. Function of Oil Filters
6.6. Types of oil filtering systems i.e. full flow & by pass flow system
6.7. Types of filtering elements, i.e. cartridge type, stack type, centrifugal type Etc..
6.8. Necessity of crank case ventilation-positive crank case ventilation
6.9. Sludge formation in the lubricating oil-effect of sludge to the Lubrications systems
6.10. Grades of lubricants used in engine, gear box, differential, steering gear box in different type of vehicles

7. Cooling System
7.1. Necessity of cooling system in Automobiles
7.2. Disadvantages of over cooling & under cooling
7.3. Constructional details of Air cooling system
7.4. Construction and working of forced feed type with thermostat water cooling system
7.5. Construction & working of water pump, radiator
7.6. Anti freezing and anti rusting additives
7.7. Viscous fan

8. Manifolds and Mufflers
8.1. Necessity of inlet and exhaust manifold
8.2. Considerations for a good manifold design
8.3. Types of manifolds-inlet & exhaust
8.4. Necessity air cleaner & filters, Types of air Cleaners, Construction and working principle of air cleaner
8.5. Function of silencer, Construction and working principle of different types of silencers

9. Performance of IC Engines
9.1. Need for engine performance testing
9.2. Different types of engine powers i.e. BHP, IHP, FHP.
9.3. Different types of engine efficiencies i.e. break thermal efficiency, indicated thermal efficiency, volumetric efficiency
9.4. Specific fuel consumption, heat balance sheet, performance Curves
Overhauling of the following Components /Units

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<td>4 Stroke Petrol Engine</td>
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<td>Solex carburetor, Carter carburetor&amp; S.U. carburetor</td>
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<td>4 stroke diesel engine and different type of diesel engine combustion chambers</td>
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<td>3</td>
<td>Universal joints and propeller shaft</td>
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<tr>
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<td>Differential Unit</td>
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<td>Charging System</td>
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<td>9</td>
<td>Starting System</td>
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<td>Battery</td>
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</table>
1.0. Clutch
1.1. Necessity of clutch in automobiles
1.2. Construction and working of a single plate, multiplate, centrifugal and semi-centrifugal clutch

2.0. Gear Box
2.1. Necessity of gear box in automobiles
2.2. Construction and working of a sliding mesh, constant mesh and synchromesh gear box

3.0. Universal Joints and Propeller Shaft
3.1. Necessity of Universal Joints & Propeller Shaft
3.2. Construction and working of cross or spider, yoke, ball and Trunion, and constant velocity type, universal type
3.3. Construction and working of enclosing type and hollow type propeller shaft
3.5. Construction and working of slip joint, Hotchkiss drive, torque tube drive

4.0. Differential Unit
4.1. Necessity of differential
4.2. Construction and working of a differential
4.3. Differential lock and self locking differential

5.0. Front and Rear Axles
5.1. Necessity of Front & Rear axle
5.2. Construction and working of live and dead axles
5.3. Construction and working of different types of stub axles
5.4. Construction and working of semi floating, three quarter floating and fully floating rear axles

6.0. Wheels and Tyres
6.1. Function of wheel & tyres
6.2. Construction and working of Disc and spoke wheel
6.3. Types of rims and their construction
6.4. Construction & properties of tyres
6.5. Different tyre tread pattern
6.6. Specifications of a tyre
6.7. Tyre rotation
6.8. Vulcanizing and Retreading
6.9. Wheel balancing and static balancing

ELECTRICAL SYSTEMS
7.0. Ignition System
7.1. Introduction
7.2. Study of wiring of Magnet ignition, Battery Coil Ignition and Electronic Ignition System

8.0. Charging System
8.1. Introduction
8.2. Construction and working of charging dynamo (D.C.Generator)
8.3. Working principle of cut-out
8.4. Voltage regulators-current regulators-construction and working
8.5. Construction & working of Alternator

9.0 Starting System
9.1. State the construction and working of a self starter (D.C.Motor)
9.2. Working principle of bendix drive with a sketch
9.3. Solenoid construction and working

10.0. Lighting, Horn and Wipers
10.1. Introduction
10.2. Working of Head lamp, side or parking light, tail or stop light, dash light, direction signal light
10.3. Adjustments of head lights
10.4. Working of Dipper, Dim light, Door light & Destination board light
10.5. Horn circuit construction and working
10.6. Working of wiper

**11.0. Battery**

11.1. Introduction
11.2. Types of Batteries: Primary & Secondary Batteries
11.3. Parts of lead acid battery, alkaline Battery, and its functions
11.4. Electrolyte ratio by weight & Volume
11.5. Understand the ampere hour and watt-hour efficiency of the battery
11.6. Know the different methods of charging and trickle charging
11.7. Know the different methods of testing of a lead-acid battery for full charged and discharged condition
11.8. Cell damage testing: sulphation, desulphation
Dismantle, Inspect & then reassemble the following components

**Total Periods per year 130**

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<thead>
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<th>Sl.N o.</th>
<th>Major Units</th>
<th>No. of Periods</th>
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<td>Single plate clutch, Multiplate clutch &amp; Centrifugal clutch</td>
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<td>Sliding mesh gearbox, Constant mesh gearbox &amp; Synchronmesh gearbox</td>
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<td>Differential unit, Propeller shaft with Universal joints</td>
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<td>Front axle, &amp; Rear axle</td>
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<td>Leaf Springs</td>
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<td>Wheel assembly</td>
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<td>7</td>
<td>Brake Assembly</td>
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<td>8</td>
<td>To dismount, dismantle, inspect, repair, service and reassemble an alternator</td>
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<tr>
<td>9</td>
<td>To inspect the working and carry out adjustment of voltage and current regulator</td>
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<tr>
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<td>To dismount, dismantle, inspect repair, service and reassemble a self starter motor</td>
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<tr>
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<td>To dismount, dismantle, inspect and reassemble a wiper motor</td>
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<td>To Check the circuit diagram of an electric horn and to carry out its adjustments</td>
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<td>To carry out adjustment of head lights</td>
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<td>To Check a battery charger and carry out charging</td>
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<td>To check wiring diagram of battery coil ignition system</td>
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<td>To Check wiring diagram of electronic ignition system</td>
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<td>17</td>
<td>Study of Speedo meter and odometer</td>
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**Total** 115
### AUTOMOBILE ENGINEERING TECHNICIAN

### AUTOMOBILE CHASISS AND BODY ENGINEERING

**THEORY- PAPER-II, II YEAR**

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<td>Painting of Automobiles</td>
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<td><strong>68</strong></td>
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Detailed Syllabus:

1.0. Chassis, Frame and Body
1.1. Introduction of Chassis frame
1.2. Layout of the Chassis and its main components
1.3. Functions of the Chassis frame
1.4. Types of Chassis frames
1.5. Various loads acting on the frame
1.6. State the different bodies used in automobiles
1.7. Explain the requirements of bodies for various types of vehicles
    viz. private, commercial etc.

2.0. Steering System
2.1. Requirement of the vehicle steering System
2.2. Types of steering gearboxes,
2.2 Types of Steering Systems and Power Steering
2.3. Steering linkages
2.4 Under steering, over steering,& Turning radius
2.5. Ackerman's & Davis Steering gear Mechanism
2.6. Steering geometry - Caster, Camber, King pin inclination, toe in and toe out
2.7 Wheel alignment
2.7. Steering defects - wheel wobble and shimmy
2.8. List out the type of steering system used in various vehicles

3.0. Braking System
3.1. Explain Functions of brakes
3.2. Requirements of automobile brakes
3.3. Explain stopping time and stopping distance
3.4. Types of Braking systems - Disc and Drum braking system
3.5. Construction and working of Mechanical, hydraulic, and air brakes,
    - Bleeding of brakes in Hydraulic brakes
3.6. List out the types of brakes used in various vehicles

4.0. Suspension System
4.1. Requirements of a automobile suspension system
4.2. Types of suspension system - conventional and Independent
4.3. Types of springs - Laminated spring, coil spring, helical spring
4.4. Need of Shock absorber - construction and working of different types of shock absorbers
4.5. Stabilizer bar and torsion bar
4.6. List out the type of suspension system used in various vehicles

5.0. Seat, Door and Window mechanism
5.1. Construction and working of door lock mechanism
5.2. Construction and working of manual window regulating mechanism
5.3. Construction and working of power window regulating mechanism
5.4. Construction and working of seat adjusting mechanism

6.0. Air Conditioning of motor vehicles
6.1. Necessity of automobile air conditioning
6.2. Construction and working of passenger car air conditioning

7.0. Painting of automobiles
7.1 Constituents of paints
7.2 Methods of painting
7.3 Painting Procedure
7.4 Reasons for failure of paint
8.0. Automobile Pollution
8.1. Effects of automobile pollution on environment and human beings
8.2. Types of automobile emissions
8.3. Treatment of exhaust gases by using catalytic convertors
8.4. Measurement of percentage of pollutants from Petrol & Diesel vehicles with the help of exhaust gas analyzers

9.0. Legal aspects of motor vehicles
9.1. Traffic signs and signals
9.2. Registration requirements
9.3. Necessity of permits for commercial vehicles
9.4. Insurance coverage
9.5. Procedure for obtaining driving licenses
Dismantle, Inspect & then reassemble the following components

<table>
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<tr>
<td>1</td>
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<td>Different types of Braking system</td>
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<td>Different types of suspension system</td>
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<td>Inspect&amp; repair of manual window mechanism</td>
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<td>Inspect&amp; repair of power window mechanism</td>
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<td>Inspect, repair&amp; gas filling of car air conditioning</td>
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<td>Practicing of painting procedures</td>
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<td>Measurement of percentage of pollutants from petrol and diesel vehicles with the help of exhaust gas Analyzers</td>
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<td>Study the various legal forms required for applying driving license, registration of vehicle, vehicle insurance and permits for commercial vehicles</td>
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# AUTOMOBILE ENGINEERING TECHNICIAN COURSE

## AUTOMOBILE SERVICING AND MAINTANANCE THEORY - PAPER – III, II YEAR

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<th>Long Questions</th>
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<td>6</td>
<td>Servicing and maintenance</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td>½</td>
</tr>
<tr>
<td>7</td>
<td>Servicing and maintenance of two wheelers</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Servicing and maintenance of three wheelers</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Servicing and maintenance of four wheelers</td>
<td>18</td>
<td>10</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>110</strong></td>
<td><strong>68</strong></td>
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</tbody>
</table>
AUTOMOBILE ENGINEERING TECHNICIAN
AUTOMOBILE SERVICING AND MAINTAINANCE
THEORY - PAPER – III, II YEAR

1. Introduction
1.1. Garage, Service Station and Specialist repair shop
1.2. Tools and equipment for a garage, service station and specialist repair shop & Power tools
1.3 Layout of a typical garage, service station and specialist repair shop

2. Major equipment for service station
   Study the construction and working of the following equipment with aid of charts/original equipment
   2.1. Car washing machine & Automatic Washing
   2.2. Vehicle hoist
   2.3. Air Compressor
   2.4. Lubrication equipment - Grease guns - Hand and compressed air operated - High pressure lubrication

3. Automobile Engine reconditioning equipment
   Study the following processes with the help of Charts/Model/Original Component
   3.1. Degreasing Plant
   3.2. De Carbonizing
   3.3. Cylinder ridge removal
   3.4. Cylinder Reboring and honning
   3.5. Valve seat cutting and grinding
   3.6. Valve refacing
   3.7. Crank shaft grinding

4. Reconditioning of Brakes
   Study the construction and working of the following equipment with aid of charts/model/original components.
   4.1. Brake drum lathe
   4.2. Brake shoe riveting

5. Reconditioning Diesel Fuel injection system
   Study the following test procedures with the help of charts/models/original component
   5.1. Fuel injection pump test bench (phasing and calibration tests)
   5.2. Fuel injector testing

6. Servicing and Maintenance
   6.1. General Procedure for servicing and maintenance of Motor Vehicles
   6.2. Types of maintenance - periodic maintenance - break down maintenance - preventive maintenance - operation maintenance
   6.3 Types of servicing - cleaning of the motor vehicle and its components - greasing of motor vehicle
   6.3. Maintenance and its role in trouble shooting of - Automobile, advantage of good maintenance

Servicing and maintenance of two wheelers
7.21 Daily, weekly and monthly maintenance or after every 2000 Km - General and periodical Check up - Servicing
7.2. Adjustment, dismantling, assembling and trouble shooting of 2 Wheelers

8. Servicing and Maintenance of 3 Wheelers
8.1. General and Periodical maintenance of 3 wheelers
8.2. Adjustment, dismantling, Assembling and Trouble shooting of three wheelers

9. Servicing and Maintenance of Four Wheelers
   Dismantling, over hauling and reassembling of the Four wheeler
   9.1. Engine
   9.2. Fuel System
   9.3. Lubrication System
   9.4. Cooling System
   9.5. Transmission System
9.6. Ignition System
9.7. Steering, brakes and suspension system
9.8. Testing the engine with the help of engine analyzer
9.9. Alignment of wheels
9.10. Balancing of wheels
The following operations to be carried out for reconditioning of vehicle components

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Major Units</th>
<th>No. of Periods</th>
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<tbody>
<tr>
<td>1</td>
<td>Decarburization</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder Reboring</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Cylinder Honing</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Valve seat cutting, grinding and refacing</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Brake drum turning, Brake shoe riveting,&amp;. Brake bleeding</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Wheel alignment - Camber, Caster, King pin inclination, toe-in,toe out - wheel balancing</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>FIP phasing and calibration test</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Fuel injector - pressure test, spray test and leak off test</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Crank shaft grinding</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>Servicing and Maintenance of Two Wheeler-1. Engine, Clutch transmission, Clutch transmission, Gear Box, Brakes, &amp; Electrical System</td>
<td>12</td>
</tr>
<tr>
<td>11</td>
<td>Servicing and Maintenance of 3 Wheeler- Engine, Transmission, Clutch transmission, Gear Box, Brakes, &amp; Electrical System</td>
<td>14</td>
</tr>
<tr>
<td>12</td>
<td>Servicing and maintenance of four wheeler- Engine, Transmission System, Brakes, Steering, Suspension, .Cooling, lubrication and fuel supply system, Electrical system &amp; Ignition system</td>
<td>22</td>
</tr>
</tbody>
</table>

**Total** 115
VII. LIST OF EQUIPMENT

Measuring Instruments and Inspection Equipment
1. Outside caliper
2. Inside caliper
3. Vernier caliper
4. Depth gauge
5. Dial indicator
6. Try square
7. Straight edge
8. Steel top
9. Pair of V. blocks
10. Special gauge for crown wheel and pinion adjustment
11. Surface gauge
12. Magnifying glass
13. Steel almarah

Machines
1. Bench drill
2. Central lathe
3. Pedestal grinder
4. Arc welding
5. Gas welding
6. Wire brush
7. Clipping Hammer
8. Cleaning Brush
9. Painting Brush
10. Floor Brush

Electrical Items
1. Heater
2. Soldering Iron
3. Inspection lamp
4. Electrical wire-
5. Insulation tape
6. Growler
7. Soldering flux
8. Voltmeter D.C. 25 volt
9. Hydrometer for Battery
10. Ammeter
11. Battery Charger
12. High range discharge tester for Battery

Hand Tools
1. Drill twist metric 3mm x 12mm x 1mm 2 sets
2. Taps and Dies complete set in box 1
3. B.A., B.S.W., Metric and American
   HSS hand Reamer Shank
4. HSS hand Reamer Taper pin

Safety Equipment
1. Goggles for Grinders
2. Goggles for welding
3. Welding glass shield/Eye shield
4. Overall
5. Rubber apron
6. Fire extinguisher foam type
7. Sand Bucket
8. Barrier cream 250 gms
9. First Aid Box
10. Stretcher
11. Padlocks
12. Metal Racks
13. Fire Extinguisher

VIII. (A) SUGGESTED LIST OF COLLABORATING AGENCIES

1. Road transport corporations, workshops.
2. Dealers, service station and workshops.
3. Reputed automobile garages.
4. Manufacturing servicing firms like TATA, LEYLAND, AMBASSADOR, PREMIER, MARUTI, STANDARD, KINETIC, BAJAJ, YAMAHA, etc.
5. Small workshops/garages/service stations.
7. Private organization garages.

(b) On the Job Training Centres:
1. All Private and Government Automobile Workshops and Service Stations (Two, Three and Four Wheelers)
2. All authorized Two, Three & Four Wheelers Service Stations
3. All Private and Government Transport Companies
X. TEACHING STAFF & THEIR QUALIFICATIONS

1. Vocational Junior Lecturer in A E T
   Degree in Mechanical Engineering/Automobile Engineering (as per G.O.Ms.No.12 HE (I.E-2),
   Dept., dated 15.02.2001

XI. VERTICAL MOBILITY
a) Without Bridge Course:
   1. Eligible for degree courses, B.A./B.Com.

b) With Bridge Course:
   1. Eligible for all degree Courses
      (Except Biology i.e., B.A, B.Com., B.Sc, MPC, Comp.Science, etc.)
   2. Eligible for direct polytechnic in II-Year in Mechanical and Automobile
      branch without Entrance Test.

XII. REFERENCE BOOKS:
1. Telugu Academy - Automobile Engineering Technician
2. Automobile Engineering - by G.B.S. Narang
3. Automobile Engineering - by R.B. Gupta
4. Automobile Engineering-Vol - I & II - by Kirpal Singh
5. The Automobile Engineering - by Harban Singh Rayatzz
4. Automotive Electrical Equipment - by P.L. Kohli
5. Elements of Technology - by B.L. Theraja
### EQUIVALENCY OF SUBJECTS

#### FIRST YEAR SUBJECTS

<table>
<thead>
<tr>
<th>Name of the existing subject</th>
<th>Name of the subject proposed.</th>
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<tbody>
<tr>
<td><strong>Theory</strong></td>
<td></td>
</tr>
<tr>
<td>Workshop Technology</td>
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<tr>
<td>Basic Mechanical and Electrical Engineering</td>
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</tr>
<tr>
<td>Auto Power Plant</td>
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</tr>
<tr>
<td><strong>Practical</strong></td>
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</tr>
<tr>
<td>Workshop Practice</td>
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<tr>
<td>Engineering Drawing</td>
<td>Engineering Drawing and Auto CAD.</td>
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<tr>
<td>Automobile Power Plant Lab</td>
<td>Automobile Engine Lab</td>
</tr>
<tr>
<td>On the Job Training</td>
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</table>

#### SECOND YEAR SUBJECTS

<table>
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<th>Name of the existing subject</th>
<th>Name of the subject proposed.</th>
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<tbody>
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<td><strong>Theory</strong></td>
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<tr>
<td>Auto Transmission and Electrical Systems</td>
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</tr>
<tr>
<td>Auto Chassis and Body Engineering</td>
<td>No Change.</td>
</tr>
<tr>
<td>Auto Servicing and Maintenance</td>
<td>No Change.</td>
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<tr>
<td><strong>Practical</strong></td>
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<tr>
<td>Auto Transmission and Electrical Systems Lab</td>
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</tr>
<tr>
<td>Auto Chassis and Body Engineering Lab</td>
<td>No Change.</td>
</tr>
<tr>
<td>Auto Servicing and Maintenance Lab</td>
<td>No Change.</td>
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</tbody>
</table>
MODEL QUESTION PAPERS
AUTOMOBILE ENGINEERING TECHNICIAN
WORK SHOP TECHNOLOGY
1st YEAR

Time : 3 Hours                                                                                                            Max. Marks : 50

Section – A

Note : (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks

1. What are the uses of copper?
2. Name the different type of vices.
3. Name types of drilling machines.
4. What is brazing.
5. Name different type of saws.
6. Define forging
7. Define core
8. What is meant by peening?
10. What is purpose of grinding?

Section - B

Note: (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks

11. What are the Important Safety precautions to be taken in work shop?
12. Draw a neat sketch of a sensitive drilling machine.
13. Explain different sheet metal joints in sheet metal work.
14. Explain different cutting tools used in carpentry.
15. Explain about different types of smithy operations.
16. What are defects in casting?
17. Write any about four hot working processes.
18. Draw the neat sketch of lathe and label its parts.
AUTOMOBILE ENGINEERING TECHNICIAN
BASIC MECHANICAL & ELECTRICAL ENGINEERING
1st YEAR

Time: 3 Hours                                                                                                          Max. Marks: 50

Note: (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks

1. Define Boundary
2. State Renault’s Law
4. Draw the P-V diagram of constant pressure process
5. Define Carnot cycle
6. What is slip?
7. What is the purpose of rivet?
8. State first aid process against electric shock
9. Define voltage
10. Write the units of work.

Section - B

Note: (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks

11. Derive the relation between two specific heats
12. Explain Otto cycle with P-V diagram
13. Classify fuels in details
14. Explain about adiabatic process P-V diagram
15. Explain chain drive and belt drive
16. Explain about Kirchhoff’s Laws
17. Define power and energy along with its units
18. Explain about megger with neat sketch
AUTOMOBILE ENGINEERING TECHNICIAN
AUTOMOBILE POWER PLANT
I YEAR
PAPER-III

Time : 3 Hours                                                                                                            Max. Marks : 50

Section – A

Note : (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks
1. What is an engine?
2. What is the purpose of piston?
3. Explain the working principal scavenging.
4. Define bore.
5. Name different stroke in 4stroke diesel engine.
6. What are the types of oil filter?
7. What is the purpose cooling system?
8. Write types of manifolds.
9. Define B H P.
10. Name different types of lubrications systems.

Section - B

Note : (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks
11. Explain the construction and working of 4-stroke petrol engine
12. Explain about zenith carburetor
13. Write about construction and working of fuel injector
14. Explain about forced feed Lubrication system
15. Explain about any one oil filter with neat sketch
16. Explain about thermosyphone cooling system
17. Explain about different type of silencers with neat sketch
18. Explain about the different types of efficiencies.
AUTOMOBILE ENGINEERING TECHNICIAN
AUTO TRANSMISSION & ELECTRICAL SYSTEM
PAPER-I
II YEAR

Time : 3 Hours                                                                                                            Max. Marks : 50

Section – A

Note : (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks

1. What is the purpose of clutch?
2. Name different type of gear boxes.
3. Mention various components of propeller shaft?
4. What is the function of front axle?
5. What is the purpose of suspension system?
6. Name types of wheels
7. What is the function of condenser?
8. What is the purpose of solenoid?
9. What is the purpose of wiper
10. What is primary battery?

Section - B

Note : (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks

11. Explain about single plate clutch with neat sketch
12. Explain about synchromesh gear box.
13. Explain about Hitchkiss drive.
14. Explain the construction and working of a differential.
15. Explain about dead axle.
16. Write about battery coil ignition system.
17. Explain the construction of DC generator.
18. Explain about lead-acid battery.
AUTOMOBILE ENGINEERING TECHNICIAN COURSE

AUTOMOBILE CHASSI SS & BODY ENGINEERING LAB
PAPER - II
II YEAR

Time : 3 Hours                                                                                                            Max. Marks : 50

Section – A

Note : (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks
1. Define chassis
2. What is meant by wheel wobble?
3. What is under steering?
4. Define stopping distance.
5. Write types of springs.
6. What is the use of window regulating mechanism?
7. What is the purpose of compressor clutch?
8. Name the different methods of painting.
9. What are different types of pollutions?
10. Draw any two traffic signs.

Section - B

Note : (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks
11. What are the loads acting on the frame?
12. Explain about air brakes with neat sketch.
13. Explain about telescopic type shock absorber.
14. Explain the construction and working of seat adjusting mechanism.
15. Explain about car AC.
16. What are the reasons for the failure of paint?
17. What short notes about the following.
   a) Different types of auto emissions.
   b) Spray painting.
18. Write the procedure for obtaining driving license.
AUTOMOBILE ENGINEERING TECHNICIAN
AUTOMOBILE SERVICING & MAINTENANCE
II YEAR
PAPER - III

Time: 3 Hours  
Max. Marks: 50

Section – A

Note: (i) Answer all the Questions 10 x 2 = 20
(ii) Each Question carries 2 marks

1. Define garage.
2. What is the purpose air compressor?
3. What is the need of servicing?
4. What is meant by bleeding of brakes?
5. What is meant by trouble shooting?
6. What is overhauling.
7. Define decarbonising.
8. What are the defects in brake drum?
9. What are advantages of good maintenance.
10. Draw the diagram of DE spanner.

Section - B

Note: (i) Answer any 5 Questions 5 x 6 = 30
(ii) Each Question carries 6 marks

11. Explain about car washing machine
12. Explain about cylinder re boring.
13. Write about brake drum lathe with neat sketch.
14. Explain about injection test bench.
15. Write short notes on:
   a) Specialist repair shop.
   b) Preventive maintenance.
16. Explain the general troubles and their remedies of a four wheeler.
17. Explain water cooling system.
18. Write the maintenance procedure for daily, weekly and monthly of two wheeler.
XIII. LIST OF PARTICIPANTS

1. M. Nagaraju
   Head of Automobile engineering
   GOVT. Polytechnic
   Masab tank, Hyderabad.

2. A M Venkata Swami
   Assistant Engineer
   A P S R T C, Yadagirigutta.

3. K Siva Rama Krishna
   J.L in A E T
   Govt. Jr. College, Chanchalguda,
   Hyderabad.

4. K. Prasad, JL in EW&SEA,
   Coordinator,
   New Government Junior College,
   Malakpet,
   Hyderabad.

5. B. Gnana Sagar,
   Professor [FAC] S.I.V.E.& Deputy Director,
   O/o the Commissioner of Intermediate Education,
   Andhra Pradesh,
   Hyderabad
EVALUATION OF ON THE JOB TRAINING:

The “On the Job Training” shall carry 100 marks for each year and pass marks is 50. During on the job training the candidate shall put in a minimum of 90% of attendance.

The evaluation shall be done in the last week of January.

Marks allotted for evaluation:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the activity</th>
<th>Max. Marks allotted for each activity</th>
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<tbody>
<tr>
<td>1</td>
<td>Attendance and punctuality</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Familiarity with technical terms</td>
<td>05</td>
</tr>
<tr>
<td>3</td>
<td>Familiarity with tools and material</td>
<td>05</td>
</tr>
<tr>
<td>4</td>
<td>Manual skills</td>
<td>05</td>
</tr>
<tr>
<td>5</td>
<td>Application of knowledge</td>
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<tr>
<td>6</td>
<td>Problem solving skills</td>
<td>10</td>
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<tr>
<td>7</td>
<td>Comprehension and observation</td>
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</tr>
<tr>
<td>8</td>
<td>Human relations</td>
<td>05</td>
</tr>
<tr>
<td>9</td>
<td>Ability to communicate</td>
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<td>Maintenance of dairy</td>
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<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

NOTE: The On the Job Training mentioned is tentative. The spirit of On the Job training is to be maintained. The colleges are at liberty to conduct on the job training according to their local feasibility of institutions & industries. They may conduct the entire on the job training periods of (363) I year and (450) II year either by conducting classes in morning session and send the students for OJT in afternoon session or two days in week or weekly or monthly or by any mode which is feasible for both the college and the institution. However, the total assigned periods for on the job training should be completed. The institutions are at liberty to conduct On the Job training during summer also, however there will not be any financial commitment to the department.