Maharashtra State Board of Vocational Examination, Mumbai 400 051

1	**Name of Course**	**Diploma Course in Mechanic Motor Vehicle**
2	**Course code**	**306406**
3	**Max no. of Students**	25
4	**Duration**	2 year
5	**Course Type**	Full Time
6	**No. of Days per week**	6 days
7	**No. of hours per day**	7 Hrs
8	**Space require**	1) Theory Class Room – 200 sqft, 2) Lab Sub. – 600 sqft, 3) Lab Elective – 400 sqft , 4) Garage + Parking – 300 sqft **Total =** 200 + 600 + 400 + 300 **= 1500 sqft** **MOU with Automotive Service Station**
9	**Entry qualification**	S.S.C. Pass
10	**Objective of syllabus**	Be aware of safety precautions and use of safety equipments and use of first aid. Do marking, simple hecksawing, filing, drilling, tapping, reaming, scraping, measuring operations Do servicing, Overhauling, lubrication work, wheel alignment work, Diagnose, Dismantle, inspect. Repair Trace out faults of engine, gear box, electronic components, electrical wiring and accessories etc. and rectify them. Drive and road test a Motor vehicle. Repair jacks, grease guns, oil spray guns and other shop floor equipment
11	**Employment opportunities**	The student can get jobs in industries relates with automobile or with working experience will be in a position to start his own independent Business.
12	**Teachers Qualification**	For Vocational Subject -B. E. Automobile or Equivalent and For Non Vocational Subject Master Degree in concern Subject.

13 **Teaching Scheme –**

Sr.	Subject	Subject Code	Clock Hours / Week		Total
			Theory	Practical	
1	**English (Communication Skill)**	90000001	2 Hrs	1 Hrs	3 Hrs
2	**Elective – I**	--	2 Hrs	1 Hrs	3 Hrs
3	**Elective – II**	--	2 Hrs	1 Hrs	3 Hrs
4	**Mechanical Technology and Material Science**	30640001	3 Hrs	8 Hrs	11 Hrs
5	**Machine Drawing and CAD**	30640011	3 Hrs	8 Hrs	11 Hrs
6	**Mechanic (Motor Vehicle)**	30640010	3 Hrs	8 Hrs	11 Hrs
Total					**42 Hrs**

14	**Internship**	Two Month Summer Internship from 1st May to 30th June is Compulsory.

15 **Examination Scheme – Final Examination will be based on syllabus of both years.**

Paper	Subject	Subject Code	Theory			Practical			Total	
			Duration	Max	Min	Duration	Max	Min	Max	Min
1	**English (Commu- nication Skill)**	90000001	3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
2	**Elective – I**	--	3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
3	**Elective – II**	--	3 Hrs	**70**	**25**	3 Hrs	**30**	**15**	**100**	**40**
4	**Mechanical Technology and Material Science**	30640001	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
5	**Machine Drawing and CAD**	30640011	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
6	**Mechanic (Motor Vehicle)**	30640010	3 Hrs	**100**	**35**	3 Hrs	**100**	**50**	**200**	**85**
Total									**900**	**375**

16 **Teachers** – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.

17 **a) For Elective I – Student can choose any one subject**

Code	Subject Name
90000011	Applied Mathematics
90000012	Business Economics
90000013	Physical Biology (Botany & Zoology)
90000014	Entrepreneurship
90000015	Psychology

b) For Elective II – Student can choose any one subject

Code	Subject Name
90000021	Applied Sciences (Physics & Chemistry)
90000022	Computer Application
90000023	Business Mathematics

Subject Code : 30640001

Subject Name - Mechanical Technology and Material Science – 1st Year

Theory	Practical
1] **Fundamental of material** Introduction of metals and non metals Structure of metal Formation of grain Imperfection in crystals Deformation in metal and change in properties Fracture Equilibrium diagram Iron, carbon equilibrium diagram Time temperature transformation diagrams	1. Take the tensile test of M.S. specimen & Draw stress strain diagram, yield pts.
2 **Ferrous metals and alloys** Pig iron and cast iron Effect of chemical elements on iron Classification of steel and its application Alloy steel and special alloy steel 3 **Non Ferrous metals and alloys** Introduction to non ferrous alloys Aluminum and its alloys Copper and its alloys Lead and its alloys Nickel and its alloys Alloys for high temperature service Metal for nuclear energy 4 **Crystal Structures** Fundamental concept Unit Cells Metallic crystal structures FCC Structure BCC Structure HCP Structure Weld ability 5 **Properties of Metal** **Mechanical properties of Metal** Elasticity, ductility, malleability, brittleness, Toughness, Stress strain behavior, Elastic limit, hooks Law, UTS, poisons ratio, factor of safety, hardness and hardness tests shear strength, resistance.	2. Study the mechanical properties like Elasticity, ductility, malleability, Brittleness, toughness of Different materials – M.S., C.S. Bronze, Copper, Aluminum Study the Hardness test Brinnel Hardness test Rockwell hardness test

Electrical properties of Metal Electrical conductivity, resistivity, electrical Characteristic of commercial alloys **Thermal properties of metal** Heat capacity, thermal expansion, thermal Conductivity, thermal stress	
6 **Magnetic Properties of metal** Basic concepts, diamagnetism and Para magnetism, ferromagnetism, influence of temperature on magnetic behavior, domain and hystersis, soft and hard magnetic material. 7 **Heat Treatment of material** Normalizing Hardening Quenching and tempering Annealing Stress Relieving Case carburizing and case hardening. Toughening Weld ability of Metal definition and concept Effect of alloying elements on weld ability Purpose and types of weld ability tests	3. Study the Electrical Properties of some conductors (conductivity, Resistively) Aluminum, Copper, Brass, Tungsten
8 **Cracking phenomena in steel** Cold crack due to hydrogen Hydrogen cracking Measurement and control of hydrogen in the deposited weld metal Cracking mechanism in the weld metal and HAZ Weld decay Lamellar tearing Hot cracking Reheat cracking	4. Study the effect on materials with heat treatment Normalizing, Hardening, Quenching & Tempering Anne ling, Stress Reliving, Case Hardening, Toughing For Different Material's M.S., C.S.,Nickel, Capper

Subject Name - Mechanical Technology and Material Science – 2nd Year

Theory	Practical
1. Bench work and fitting Introduction- Vices – Hammers- Chisels- Chipping- Files- Filling- Scrapper- Scraping-Grinding and Polishing- Hacksaw sawing- Marking tools – Surface plate- Scriber – Punch- V block- Angle plate- Try square –Marking out –Drill- Drilling- Reamer- Reaming- Taps- Tap drill size- Tapping – Dies and stock- Dieing. **2. Sheet Metal Work** Introduction – Metal used in sheet metal work-Sheet metal hand tools- Sheet metal operation-Sheet metal joint- Hems and Sems – Sheet metal allowance- Sheet Metal working machine-Laying out a pattern **3. Plumbing, Threading, Fasteners & joints** Plumbing- Specifications of pipes- Material used for pipes-Pipe fitting & Joints-Taps & valves –Plumber tools – Threaded fasteners- screw threads and their uses- Indian standard threads-Cap screw and machine screw-Set screw- Methods of producing screw threads- Bolts- Studs- Forms of nuts- Riveting joints. **4. Smithy and Forging** Maintenance and application of smith health-Anvil- Swage block-Tongs- Hammer-Flatters-Measuring tools e.g.-Try square- Steel rules-Calipers-Operations e.g. up setting- drawing down- bending setting- forge welding. **5. Welding Technology** Welding Welding introduction to different welding processes, like gas Welding, ARC welding TIG, MIG, submerged arc welding, spot Welding, electrodes etc. Brazing methods & application, Knowledge of welding skills.	**Fitting** 1. Filing Flat surfaces: Checking flatness and square ness using a try square – Types of filing – Cleaning files. 2. Chipping: Hints on chipping 3. Hack sawing: Selection of blades for different metal sections - Fix hack sawing the material for the job blades maintaining. Correct tension and direction – Hack sawing. Filing 'V groove and complex profile by file & check with profile gauge. 4. Filing radius –check with radius gauge 5. Check profile with profile gauges. 6. Drill plate, Drilling, counter sinking, counter boring. Operations on job 7. Drilling and Tapping: Internal threading of holes by using hand taps – determine the tap drill size, drilling, counter- sinking and tapping – precautions with tapping a blind hole. 8. External thread cutting using die.

6. Metal Turning (Lathe) 6.1 Function of lathe, Types of lathe, the size of lathe, Descriptions & function of lathe parts, 6.2 Lathe accessories and attachments. 6.3 Operation on Lathe 6.4 Cutting Tools, Classification , Influence of tool angles. 6.5 Types of tools, cutting speed, Feed, Depth of cut, 6.6 Machining time. Cutting tool signature.	
7. DRILLING Introduction Types of drilling machine, Portable drilling machine, Sensitive drilling machine. Upright drilling machine, Radial Drilling Machine; Gang drilling machine, Multiple spindle drilling machine Automatic drilling machine, Deep hole drilling machine; The size of a drilling machine, Upright drilling machine parts. Radial drilling machine parts, Work holding devices, Tool holding devices, Drilling machine operation, Drilling machine tools. Twist drill nomenclature. Drill size Designation of drill material Reamer, reamer nomenclatures. Counter bore, Countersinks and spot face, Taps. Tap nomenclatures. Cutting speed Feed, Depth of cut, Machining time in drilling	**Basic Workshop Practice** 1. Step turning and Radius forming: Free hand form turning – by using form tool. 2. Drilling and Boring-Use of inside caliper and outside Micrometer for bore measurement. 3. Drilling and reaming: by hand-Method of checking the bore With a plug gauge. 4. Drilling and step Boring: Boring blind hole with a boring tool.
8. SHAPER Introduction. Types of shapers. Principal parts. Shaper size; Shaper mechanism; Work holding devices. Shaper operations. Shaper tools; Cutting speed, feed and depth of cut; Machining time. **9. SLOTTING** Introduction. Types of slotting machine; Slotter size; Slotting machine parts; Work holding devices; Slotter operation; Slotter tools; Cutting speed, feed and depth of cut.	5. Drilling, Boring and Recessing: Internal recessing to a size broader than the width tool – Form a recess. 6. Shaping blind & open keyways on shaping machine 7. Shaping irregular surfaces.(Concave / Convex)

10. Powder Metallurgy Introduction- Process Description- Manufacture of metal powder- Blending of powders- competing profiteering- Sintering-Secondary operation –ISO Static pressing –Product of powder metallurgy- Advantages of process –Disadvantages and limitation-Design considerations Introduction to CNC	8. Slotting internal grooves on slotting machine 9. Welding Practical-fusion run with/without filler rod on MS Sheet – squire butt joint on MS sheet LAP,T& Edge joint on M.S. Sheet

Subject Code : 30640011

Machine Drawing and CAD - 1st Year

Theory	Practical
1 **Introduction of Drawing** Use of different drawing instruments, equipments & Drafting Techniques, Types of letters, conventions of line, Scales;plane scale and diagonal scales. 2 **Curves & Tangential Exercises** To draw an ellipse by 1. Arcs of circle method 2. Concentric circle Method 3. Rectangle / oblong method; To draw a parabola by 1. Dircetrix focus method 2. Rectangle method; To draw hyperbola 1. Transverse axis and focus Method 2. Passing Through a given point; To draw an Involutes of 1. A polygon (up to Hexagon) 2. A circle. To draw a cycloid, epic cycloid & hypocycloid. 3 **Orthographic Projections** Introduction to orthographic projections, first and third angle Method of projection, conversion of simple pictorial view into Orthographic view Dimensioning technique 4 **Sectional Views** Conversion of given pictorial view into sectional orthographic views. 5 **Orthographic Views** Isometric scale and views of simple objects; isometric views of Rectangular, cylindrical objects and Representations of slots on Sloping faces. 6 **Projections of Lines** Projections of solids- prism, prism, cone, cylinder, Tetrahedron; axis Inclined to one reference plane only. 7 **Section of Solids** Sections of the solids-prism, pyramid, cone, cylinder, Solids resting on their bases on the Ground Section plane is inclined to one Reference plane and perpendicular to other	1. Practice: Layout of drawing sheet Types of lines – Thickness, shade of lines and its General applications. Practice: Draw type of lines as per IS-70714-1983 Type of Angle, Triangles and their types. Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement and indication of dimensions. Place dimensions in the drawing by aligned system and unidirectional system, Give dimension to the given drawing by following dimensioning principles as per BIS Method of dimension common features. Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic. 1. Practice: Construct square, rectangle, parallelogram, rhombus, trapezium and quadrilateral 2. Practice: Draw a regular pentagon by circum scribing & inscribing 3. Practice: Draw a regular hexagon by arc method 4. Practice: Draw a regular pentagon, octagon and various types of tapers 5. Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse. 6. Practice: Prepare proportionate free hand sketches of plane figures 7. Practice: Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand. Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing. 8. Practice: Draw a plan, elevation and side view of prism and cylinder, cone and pyramids 9. Practice: Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements. Drawing Isometric views out of orthographic views – Simple Machine Elements 10. Practice: Construct an isometric scales to a given length

8. **Conventional Representation** Introduction; Conventional Representation of Material; Conventional breaks, Machine components such as splinted shaft; bearings, slotted heads, raced & pinion, Internal & External Threading, Springs, Gears, Pipe fitting & pipe joint, Welded joint; Practice Drawing of all type of Conventions in the sketch book. 9 .**Limit Fits & Tolerances** Process Tolerance, Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing, Introduction of dimensional; Tolerances Element of Interchangeable system, Tolerance; Fundamental tolerance, Calculation of limit size, Method of specifying dimensions of fit, limit & Tolerance, Geometrical Tolerance, form tolerance, Position Tolerance, Indication of Geometrical Tolerance; types of geometrical Tolerance.	11. Practice: Draw the isometric projection of cube, hexagonal prism, cylinder and cone 12. Practice: Draw the isometric view of the objects/blocks/solids with curved surfaces Missing lines and views. 13. Practice: Visualize the shape of the object from the given two views and add the third views – simple machine elements 14. Practice: Identify the lines missed in multi views and supply them. Identify at least five shapes satisfying a given view. One problem on each projection of lines and plane are to be drawn in A-3 size sketch book. 15. Identify the third view for the given two views of similar in shapes and size. Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones. 16. Practice: Draw the development of surfaces of a cube and prism 17. Practice: Draw the development of surfaces of a cylinder and cones Explanations of full – sectional view, half-sectional view, aligned sections.
10. **Production Drawing** Introduction, need, scope; Production drawing procedure, Production drawing for, Nut & Bolt, Spur gear, Fly – cotter joint Wheel, V belt pulley.	18. Practice: Draw full and half sectional view of simple machine elements. Conventions and symbols used in drawing, Abbreviations used in engineering drawing, surface finish symbols, Welding symbols and Annotations. 19. Practice: Draw surface finish symbols, Welding symbols and Annotations. Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing, Blue print reading of various Engineering drawing and Machine drawing. 20. Practice: Blue print reading of Engineering Drawings and Machine drawing. Introduction to free hand sketching of machine parts. Tracing and printing of drawing. Introduction to Auto CAD, 3D modeling concept. 21. Practice: Draw the elevation, plan and the side view of Nut & Bolt, Spur gear, and Fly cotter joint Wheel, V belt pulley.

Machine Drawing and CAD – 2nd **Year**

Theory	Practical
A] Computer Fundamental	
1] Fundamentals Of Computer Introduction Components of PC The system Unit Front part of system Unit Back part of system Unit CPU Memory of computer Monitor Mouse, Keyboard Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	1. Working with Windows 2000 desktop ,start icon, taskbar, Recycle Bin, My Computer icon ,The Recycle Bin and deleted files Creating shortcuts on the desktop 2. The Windows 2000 accessories, WordPad – editing an existing document, Use of Paint – drawing tools, The Calculator, Clock 3. The Windows Explorer window, concept of drives, folders and files? Folder selection techniques, Switching drives, Folder creation, Moving or copying files, Renaming, Deleting files ,and folders 4. Printing, Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts, The clipboard and 'drag and drop', Basic clipboard concepts Linking vs. embedding,
2] Introduction To Windows 2000/Xp Working with window Desktop Components of window Menu bar option Starting window Getting familiar with desktop Moving from one window to another Reverting windows to its previous size Opening task bar buttons into a windows Creating shortcut of program Quitting windows	5. Moving through a Word document menu bar and drop down menus toolbars 6. Entering text into a Word 2000 document, selection techniques Deleting text 7. Font formatting keyboard shortcuts 8. Paragraph formatting Bullets and numbering 9. Page formatting What is page formatting? Page margins Page size and orientation Page breaks, Headers and footers 10. Introducing tables and columns
3] GUI Based Editing, Spreadsheets, Tables & Presentation Application Using MS Office 2000 & Open Office.Org Menus Opening, menus, Toolbars, standard toolbars, formatting toolbars & closing Quitting Document , Editing & designing your document Spreadsheets Working & Manipulating data with Excel Changing the layout Working with simple graphs Presentation Working With PowerPoint and Presentation	11. Printing within Word 2000 Print setup Printing options Print preview 12. Development of application using mail merge Mail merging addresses for envelopes Printing an addressed envelope and letter 13. Creating and using macros in a document 14. Creating and opening workbooks Entering data 15. Navigating in the worksheet Selecting items within Excel 2000 Inserting and deleting cells, rows and column Moving between worksheets, saving worksheet, workbook

4] Introduction To Internet What is Internet Equipment Required for Internet connection Sending &receiving Emails Browsing the WWW Creating own Email Account Internet chatting	16. Formatting and customizing data 17. Formulas, functions and named ranges 18. Creating, manipulating & changing the chart type 19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet 20. ***** Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation
5] Usage of Computer System in various Domains Computer application in Offices, books publication data analysis ,accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.	21. Using the AutoContent wizard ,Starting the AutoContent wizard, Selecting a presentation type within the AutoContent wizard Presentation type Presentation titles, footers and slide number 22. Creating a simple text slide, Selecting a slide layout Manipulating slide information within normal and outline view, Formatting and proofing text, Pictures and backgrounds, drawing toolbar, AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter
	23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slide show timings. Animation effects 24. Microsoft Internet Explorer 5 & the Internet Connecting to the Internet The Internet Explorer program window, The on-line web tutorial Using hyper links, Responding to an email link on a web page 25. Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet using Web Crawler, Searching the Internet using Yahoo, Commonly used search engines
6] Information technology for benefits of community Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology	26. Favorites, security & customizing Explorer Organizing Favorite web sites Customizing options – general, security, contents, connection, programs, advanced 27. ***** Using the Address Book Adding a new contact, Creating a mailing group, Addressing a message, Finding an e-mail address 28. Using electronic mail, Starting Outlook Express, Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying

	29. Email & newsgroups, Creating and sending emails Attached files, Receiving emails, Locating and subscribing to newsgroups, Posting a message to a newsgroup 30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar
Minimum system requirement for AutoCAD **Starting AutoCAD** – Use a Wizard, Use a Template, Start from Scratch, Open a Drawing, Quick Setup method, Advanced Setup method, Types of Units, **AutoCAD Window Details** – Menus, Toolbars, Command line area, Drawing area, WCS icon etc, Use of Function keys, **Modes in AutoCAD** – Snap, Grid, Ortho, Osnap, Polar, Otrack, Model **Using various Toolbars**, Creating new drawing, Saving a drawing, Closing a drawing, Opening a drawing, Use of mouse in AutoCAD, Use of Keyboard, **Coordinate system** – Types of Coordinate, Absolute, relative, polar coordinate **Draw commands** – Line, Ray, Construction line, Spline, rectangle, Polygon, circle, ellipse, Arc, Donut, Polyline, Multiline, Multiline Style, Point, Point Style, Divide, measure **Zoom commands** – Real-time zoom, pan real-time, zoom window, zoom all, zoom in, zoom out, zoom center, zoom dynamic. Zoom scale, zoom previous.	Practical related Creating New file, Closing Drawing, Saving Drawing, Startup Methods, Modes in AutoCAD, Use of Function Keys, Use of Keyboard and Mouse in AutoCAD Practice. CAD Command Practice on small objects
Object Snapping – Dialog box, Toolbar, Tracking, snap p from, end point, mid point, center, intersection, apparent intersection, insertion, quadrant, tangent, perpendicular, node etc. **Editing commands** – Setting drawing limit, setting units, drawing area parameter, Copy, move, erases, opps, scale, rotate, stretch, lengthen, break, trim, extend, chamfer, fillet, mirror, offset, align, explode, array – rectangular & polar, editing using grips, edit Polly line, edit multiline, using property dialog box., Match property, using single line text, using multiline text, editing text, creating text style.	Practice on Small Drawing Objects using Commands in Draw Menu Practice of Editing command on above drawing objects, Dimensioning Drawing Creating Title block, Creating Part List, Material List using Text in AutoCAD, Drawing Plan, Elevation, Section, in AutoCAD for various mechanical objects, machine part etc.

Dimensioning technique – Linear, Aligned, Radius, Diameter, Angular, Baseline, Continuous, Leader, Center mark, creating dimensioning style. **Block, Wblock, Attribute.** **Hatch, Boundary, Region.** **Object property toolbar** – layer control, color control, Line type control, line weight control, working with layers, (freeze, thaw, lock, unlock, plot etc.) **Printing and using scale in the drawing**.	
Viewing Orthographic projections, Viewing Isometric projections, Plan View, Aerial View Window, Using Named Views, Using multiple Tiled View ports – New view ports, Polygonal View ports, object viewports, named view ports, joining viewports, Floating viewports in paper space, Region, Redraw, Regen all command. **Shading** the model – 2D wireframe, 3D wireframe, Flat shaded, Gauged shaded, hidden view Region, Redraw, Regen all command. **Interacting Viewing in 3D** – 3D orbit command, panning, zooming, adjusting the view, Adjusting the camera distance, swiveling the camera, Continuous orbit, using Visual aids – Compass, Grid, UCS icon etc Concept of Wire frame modeling, Surface modeling, Solid modeling, Concept of Thickness & Elevation	Suitable CAD Practical (Command Practice) based on the Theory. Creating Simple 3D Model of Machine assemblies required 3D view from all sides. Practice of using AutoCAD Mechanical Desktop package for creating various 3D Machine Elements.
Surface modeling – Ruled surface, Edge surface, Revolve surface, Tabulated surface, 2D solid, 3D face, Using Predefined 3D surface objects – Box, pyramid, Wedge, dome, sphere, cone, tours, dish, mesh. **Solid modeling** – Extruding solid, Revolving solid, Slicing & Interfering solid, using predefined 3D solid objects - Box, pyramid, Wedge, Cylinder, Cone, Torus **Modifying 3D Solid** object – 3D array, 3D mirror, 3D Rotate, Trim, Extend, Fillet, Chamfer etc. **Boolean operation** – Union, Subtract, intersect.	Creating, Rendering, and Viewing Various Machine parts and assemblies Elements like different types of Screws, bolt, nut, nail, rivet, keys, cotter, locking devices, stud, plates, angle, channel, sockets, cover, packings, gasket, belt, wheels, gear, grooved parts, casting, supports base plates, pipe joints, I section joints etc.

Solid Editing – Extrude face, move face, offset face, delete face, rotate face, taper face, color face, copy face, color edge, copy edge, imprinting the object, Cleaning, separating objects, shelling the solid Checking validity of solid object. **Rendering 3D solid** – Rendering options / Rendering procedure – query, crop window, skip dialog box method, Rendering, using light effects in rendering – Distance light, point light, spot light, using Sun angle calculator for shaded model, modifying lights parameter, using lights in scene. **Applying material** effect to solid object. Using material library. Mapping background. Using background images **Printing the 3D rendered view / drawing**.	Creating, Rendering, Viewing, Generating JPEG images for Complete assembly model, Printing Photo with various View of machine assemblies, Creating Slide show presentation of such views of assembly model including All four side view, 3D view from four corner, Isometric View, Perspective View etc. Introduction to 3DS Max Software Package for animation Purpose. Introduction to Pro-Engineer, CATIA Software.

Subject Code : 30640010

Subject Name : Mechanic (Motor Vehicle) - 1ST YEAR

Theory	Practical
General introduction to the course duration of the course and course contents.Study of the syllabus . General rules pertaining to the institute , facilities available, hostel, recreation, medical and library, working hours, time table	Familiarisation with the institute. Importance of the course. machinery used in the course.. Types of work done by the students in the shop floor. Induction and safety training
Importance of safety and general precautions to be observed in the shop. Fire extinguishers used for different types of fire storing & handling of inflammable materials Elementary first aid	Description of safety equipments their use, safety rules to be observed in an automobile repair shop. Accidents their causes up keep of fire extinguishers familiarisation of the tools and machinery available in the shop their use & upkeep. Importance of cleanliness of work spot, tools, Jacks,trays & horses etc.
	Fitting
Systems of measurements conversion of English into metric measurements and vice-versa. Marking material chalk mechanic blue or red lead. Tools used in marking steel rule Try square, calipers, dividers, scribers pric and centre punch ,hammer and chisel. Their uses & maintenance safety precautions in handling grinding machines. Types of hacksaw frames & blades their selection & uses types of files & their uses care & maintenance of files.	Demonstration & use of fitters. Hand tools, marking off with steel rule, calipers, scribers, dividers, dot & centre punch. Chipping in marked lines sharpening of chisels centre punch dot punch for correct angles. Hacksawing & filing to given dimensions filing true and square different types of filing operations.
Types & sizes of drills Cutting angles & speed & feed of drills. Calculation of tap drill sizes, taps & dies Description & use of different types of taps & dies Use of "V' threads. Precautions while using taps & dies. Description & use of different type of scrappers reamers & Emery papers.	Marking & drilling clear & blind holes, safety precautions to be observed while drilling tapping a clear & blind hole Adjustment of two piece dieriming a bush to suit the given pin / shaft. Scrapping a given machine surface.
Construction & method of reading micrometer (Internal & external) & vernier calipers, correct handling of micrometer & vernier calipers. Reading of vernier scale description & use of combination set vernier bevel protector. Care & maintenance of micrometers vernier calipers combination set etc.	Measuring diameters of pistons main journals , crank pins , king pins big & main bearings, cylinder bores with micrometer & vernier calipers, Measuring width & thickness of machined flat & round bars, measuring of value angles with protector head locating of a round bar with centre head.
	Sheet Metal Work
Sheet metal workers hand tools their description of simple soldering and brazing fluxes used for common joints types of sheets metal joints their uses sheet and wire gauges the blow lamp and its uses pipe fitting explanation of various common metal sheets used in sheet metal shop.	Joining of metal parts by soft soldering. Simple marking out on steel metal, cuttering, bending and folding. Practice of silver soldering. Pipe bending. Annealing of pipes. Fitting nipples and unions in pipes. Soldering and brazing of pipes

	Servicing and Lubrication Work :
General description of motor vehicles. Major assemblesies- description location and function of each. Details of diesel & petrol vehicles and battery operated vehicle.	General servicing of vehicle washing, cleaning, oiling, greasing, and lubrication
Different locking methods and devices used in vehicles hydraulic and screw jacks hydraulic hoist and air compressor their description and uses.	Inspection of under carriage of vehicle tightening all loose bolts and nuts.
Modern locking devices and their uses.	Use of hydraulic jacks, hoist and horsess. Selecting materials for packings, cutting packing and gaskets. Practice and use of common locking devices such as lock nuts, cotter and split pins, rivets, keys, circlips, lock rings, lock washers wire locking and locatings where these are used . Use of modern locking devices such as Engg. Adhesives and chemicals.
	Suspension and Steering Work :
Description of wheels & tyres- types- section of tyres, ply rating , inflation pressure & carring capacity, storage of tyres.	Removing wheels from vehicle dismantling tyres and tubes checking and repairing punctures in tubes, assembling, inflating to correct pressure rotating the wheel in a vehicle, minor repairing of wheels and tyres.
Frames-description & function. Common trouble in conventional suspension system. Types of leaf springs. Different types of shock absorbers-their description, operation & maintenance.	Inspecting the frame checking alightment of frame-servicing of spring. Replacing new bushes for shackle pins. Changing bushes in shock absorvers-cleaning & lubrication of waheel bearing, adjusting wheel bearing.
Description of different types of independent suspension system- Special features in each system. Maintenance and lubrication of front suspension system.	Removing king pins and bushes replacing new bushes and pins after reaming, and lubrication of king pin bushes, changing rubber bushes in the front, independent suspension system.
The front axle-description and function, types of stearing knuckles, arrangement of steering knuckle joint, general lay out of steering linkkages.	Inspect and over haul front and rear suspension rear springs, coil springs-Torsion bars. Check up dead axle for alignment.
Description of different types of steering boxes-special features of each, adjustment repair and maintenace of steering boxes. Power steering-description and its advantages.	Inspect and adjust steering linkages, after replacement of worn parts.Alignment of steering wheels with respect to front wheel.
Description of ackermans angle, caster, camber, toe in and toe out on turn, purpose and effects of these angles.	Inspect & overhaul steering boxes-adjusting steering gear back-lash and end play.Check and adjust toe-in, camber angles checking king-pin inclination and caster angle with special gauges
	<u>Brake Work</u>
Arrangements of brakes in cars and trucks-description of hand brake and its purpose. Layout of mechanical and hydraulic braking system in cars.	Adjusting brake pedal play. Dismentling wheel brake assembly- cleaning and inspecrting-adjusting brake shoes for proper clearances. Bleeding hydraulic brakes.

Master cylinders – types including the tandem master cylinder, special features of each functions- common troubles and remedy .	Removing master cylinder – dismentling cleaning and inspection of parets –assembling and testing- bleeding the braking system after cleaning the pipe lines.
Brake lining- types, uses- relining the brake shoes- pre- cautions to be obsorbed. Wheel cylinders- description, function and types. Brakes fluids- description and use types of fluids used.	Dismentling wheel brake assembly – removing old lining and fitting new lining on the brake shoe.removing and cleaning of brake drums inspecting wheel cylinder and brake drums. Fitting new cups and brake hose pipes- re assembling. Adjusting wheel bearings and testing and adjusting all 4 wheel brakes.
Description and advantages of vacuum assisted hydraulic brakes- special features- common troubles in vaccum assisted hydraulic brakes.	Bleeding of vaccum assisted hydraulic brakes- removing and refitting of vacuum boosters- repairs to pipe lines- adjusting the barracks in vaccum assisted hydraulic brakes.
Description of air brake system- major components in system, description and purpose of each part, their care and maintenance- troubles in the air brake assembly and their remedy.	Adjusting air brakes- repair to the tank unit, air compressor, wheel brake adjusters- locating air breaks in the brake lines and rectifying- general maintenance and care-
Brake testing- efficiency of brakes- braking distance, weight transferance during braking a vehicle- common troubles in brakes and their remedy.	Trouble tracing in braking system of a vehicle- adjusting brakes and balancing all four wheel brakes, precautions to be observed while testing brakes. Points to remember while prepairing the vehicle for brake certificate.
	<u>TRANSMISSION WORK:</u>
Layout of transmission system, description of single plate clutch and multiple plate clutch- functions- different types of clutches used in vehicle- their description special features and advantages	Adjusting clutch pedal play- removing gear box and clutch assembly from vehicle. Dismantling clutch assembly cleaning and inspecting parts.
Clutch lining- types- materials used- bonded and riveted lining clutch plate construction, purpose of damper spring- precautions while relining a clutch plate	Removing and fitting of new pilot bearing. Removing and fitting of ring gear in fly wheel. Relining a clutch plate- checking condition of flywheel and pressure plate surface for reconditioning.
Fluid coupling- description operation and advantages of using fluid coupling- common trouble and remedy.	Assembling of pressure plate- adjusting the fingers- checking run out of fly wheel and aligning clutch assembly with flywheel.
The purpose of gear box in vehicle- description and function of a sliding mesh gear box- common troubles in gear box and their remedies.	Dismantling a four-speed sliding mesh gear box. Cleaning inspection of parts for wear/ damage. Assembling the gear box and filling in oil.
Lubrication of gear box, constant mesh gear box- description and advantages.	Dismantling cleaning and assembling of gear shift mechanism- changing oil in gearbox, studying gear ratios in the gearbox.

Universal joints and propeller shaft- open and closed type propeller shaft. Types of universal joints- care and maintenance, constant velocity joints-special features and advantages.	Removing open type propeller shaft from vehicle,. Removing universal joints- cleaning, inspecting-replacing of worn out parts, reassembling and fitting to vehicle. Special precautions while removing torque tube drive shaft.
Description and purpose of different types of rear axles-special feature and advantages of each type, lubrications of rear axles-reasons for oil in brake drums.	Removing rear brake drums and adjusting the wheel bearings in full floating rear axles and semi- floating axles replacing oil seals in rear axles.
Description and functions of final drive assembly-crown wheel and tail pinion-hypoid gear and its lubrication Description of differential and its principle of operation.	Removing rear axles assembly from vehicle, dismantling, cleaning, inspecting parts for wear and damage, cutting packings/gaskets, removing tail pinion and bearings-cleaning and inspection of oil-seals and bearings.
Description and function of differential gears-types- tooth contact and back lash, preloading adjustment . common trouble and their remedy in axle assembly.	Checking tooth contact in crown and opinion and adjusting backlash. Assembling the rear axle and fitting rear axle assembly on vehicles and testing.
Description and purpose of optional fittings such as transfer case-free wheel- power take off- common troubles in these units and their remedy care and maintenance.	Trouble shooting in the transmissions system of vehicle- detecting noises from clutch, gear box, universal joints, and rear axles assembly. Dismantling transfer case from vehicle- cleaning, inspecting, replacing worn parts, reassembling and fitting to vehicle.
	Primary Engine Work
Description of internal and external combustion engines different types of I.C.engines, important working parts in the engine the 4-stoke cycle.	Dismantling of unserviceable engine- cleaning, studying the parts in the engine and assembling the engine, practice in the use of correct tools and right procedure.
Two stroke cycle, difference between 4 store and 2 stroke cycle engine. Description of valve operating mechanism and valve timing. Description and function of valve springs , guide, tappets, valve seals and locks.	Dismantling an unserviceable engine, cleaning of parts in the engine, measuring of cylinder bore-crank pins, main journals, pistons, studying valve-operating mechanism.
Description and function of cylinder block, cylinder head cylinder liners. Reconditioning of cylinder heads.	Checking compression pressure in a running engine, dismantling the cylinder head from the engine decarbonising the cylinder head, removing the valves cleaning reassembling and adjusting tappets.
Description and function of different types of pistons , piston rings and piston pins- common troubles and remedy.	Removing pistons and connecting rods from engine- dismantling cleaning, inspecting checking clearance, installing rings and piston pins.
Description and function of connecting rods materials used for connecting rods–big and end main bearing shells- piston pins and locking method of piston pins –crank shaft- description function and types. Common troubles and remedies.	Removing connecting rod assembly- cleaning, checking bearing clearances replacing bearing shells, setting correct clearance, measuring wear in crank pins and main journals in crank shaft.

Firing order of the engine , crankshaft balancing. Description of the fly wheel and its function, crank case and oil sump.	Assembling crankshaft, main bearing, connecting, rods and piston assembly in the engine. Fitting cylinder head and starting the engine and tuning up engine for smooth, slow speed running.
Engine cooling methods, air and water cooling- radiators pump themostat and fans- their description, care and maintenance. Reason for engine overheating.	Checking and cooling system for overheating, cleaning radiators, dismantling, cleaning, assembling and testing water pumps, reverse flushing the system and adjusting the fan belt tension.
Need for lubrication of engine parts- Friction, lubricant and its properties, lubrication system, types- full flow and by-pass flow system, components in lubrication system, oil filters and pump -–types, their special feature and uses. Types of lubricants and their properties.	Studying the lubrication, oil flow system in engine. Over-hauling oil filters, oil pump and setting the pressure release valves for correct oil pressure. Maintenance and repair in the lubrication system in engine.
Fuel feed system in motor vehicles – description and layout of the system. Description, operation, maintenance of petrol pump, petrol filters and carburetors. Types of fuel and their properties. Petrol injection system. Types of carburetors, special features , - advantages, different adjustments and their purposes.	Simple repair in fuel feed system – overhauling of petrol pump, carburetors, fuel filters and air cleaners. Introduction to petrol injector. Repair to solex and SU carburetors adjusting float level and slow speed adjustments – studying the fuel flow circuit in carburetor.
Explanation of engine tune up, job description of compression and vacuum testing – description of ignition timing setting and slow speed adjustment.	Practice in engine tune up in a vehicle. – testing vacuum and compression of engine, adjusting tappets setting ignition timing and adjusting carburetor for slow speeds.
	Basic Electical and Electronics Work
Simple electrical circuits series and parallel circuits, Identification of alternating current and direct current meters. Insulators, conductors types of resistance – ohm's law and its application, Common electrical terms and symbols – primary and secondary cells- lead acid battery –description –construction – common troubles and remedies	Practice in jointing wires and soldering. Forming simple electrical circuits. Measuring of current, voltage and residence. Cleaning and topping up of a lead acid battery. Testing battery with hydrometer. Cell tester. Connecting battery to charger.
Description of electrical circuits –ignition system and the components –purposes of induction coil, condenser, spark plugs. Common troubles in ignition circuits and remedies	Studying electrical circuits in the engine assembly checking loose, open and short circuit in ignition circuits. Cleaning and testing spark plugs. Overhauling of distributor assembly. Checking and setting ignition timing
Description of charging circuits – operation of dynamo and regulator Unit – Ignition warning lamp – trouble and remedy in charging system	Removing dynamo from vehicle- dismantling, cleaning , checking for defects –assembling and testing for motoring action of dynamo and fitting to vehicle.

Description of starter motor circuit - constructional details of starter motor . Solenoid switches . Common troubles and remedies in starter circuit	Removing starter Motor from vehicle and overhauling the starter motor –testing of starter motor
Introduction to electronics – Definition of resistor, capacitor and inductor and their principles of working. Different types of Diodes, transistors, power supply for electronic circuit	Identification of different Electronic Devices, Testing of electronic device, fault finding in Electronic circuits and remedies.

Subject Name : Mechanic (Motor Vehicle) - Second Year

Theory	Practical
Methods of engine repair fitting new liners – types and advantages of liners, procedure of decarbonising and valve reconditioning in an engine – common defects in valves – valves reface and seat angles. Reasons for valve bouncing _importance of correct tappet clearances	**Further practice on petrol engine repair work** Removing a petrol engine from a motor vehicle – dismantling cylinder head, decarbonising checking valves – cutting valve seats, replacing worn guides and weak springs , assembling valves and cylinder head and adjusting tappet clearance in a side valve engine
Reasons for cylinder wear – methods of reconditioning worn out cylinders. Precautions to be observed while removing and fitting piston and connecting rod assembly in cylinder bore	Removing piston and connecting rods from engine checking cylinder bore wear for ovality and taper. Checking piston ring grooves and cleaning – measuring piston size – removing gudge-on pin and Bushes – checking wear – refitting new bushes and pins
Bearing types- their special advantages and special features – bearing metals, their composition, bearing spread – nip and crush – their purpose, Lubricating pumps. Types and their special features. By pass and full flow oil filters	Checking main and connecting rod bearing, Checking connecting rod alignment, fitting new bearing shells and setting correct oil clearances . Checking and cleaning oil passages in crank shaft and engine block over hauling and testing oil pumps . Cleaning oil filters
A.C. Mechanical Petrol pump Description and operation – electrical pump (S.U . Pump) – construction , operation and care and maintenance.	Cleaning fuel tank and checking for leaks in fuel tank. Overhauling petrol pumps testing petrol pumps for correct pressure vacuum and delivery
Special feature of solex and S.U. carburetors, petrol flow circuits in these carburetors – functions of each component in the carburettors, common troubles and remedies.	Further practice in removing, dismantling, cleaning , inspecting, replacing, worn parts and assembling and fitting of solex and S,U. carburettors. Practice in adjusting the slow speed screw and setting idling speed of engine

Valve timing gears – Timing marks, timing chains and chain tensioners – effects of stretched chains – checking backlash in timing gears	Removing valve timing – cover –checking and correct setting of valve timing replacing timing chains. Checking camshaft, and play and correcting it
Engine Assemble procedure as recommended by Makers –Precautions to be observed while assembling engine components, checking and adjusting engine idle speed with vacuum gauge	Assembling piston and connecting rod assembly, crank shaft , camshaft and timing gears , fitting cylinder head and checking valve tappet clearance , starting and adjusting engine speed
Inlet and exhaust manifold – description and purpose of manifolds, exhaust pipes and silencer box. Constructional details and purpose and types of silencers. Common troubles in exhaust system and their remedy	Removing inlet and exhaust manifold – cleaning carbon and checking for warpage and crack – checking heat control valve in exhaust manifold for proper working. Removing and replacing of new manifold gaskets and checking leakage of exhaust gases. The removing and cleaning silencer and tail pipe and refitting 2. <u>Trouble shooting in cooling Lubrication fuel feed and ignition systems,</u>
Step by step method of locating troubles in the lubrication and cooling system. Reasons for engine overheating flow test rate recommended for radiator . Crank case dilution and crank case ventilation	Troubles shooting in cooling and lubrication system. Checking up and connecting oil and water leaks – changing defective packing and gaskets. Testing radiator for leaks – testing thermostat
Systematic procedure of trouble tracing in fuel feed and ignition system in automobile engine – Reasons for excessive fuel and oil consumption	Trouble shooting in fuel feed and ignition system –starting engine- checking air leaks. Repairing of silencer and tail pipes. Adjusting the slow speed of the engine with vacuum gauge.
	Disel Engine Repair Work
History and development of compression ignition engines. Classification of C.I. Engine , Advantages and disadvantages over petrol engines – constructional details of single and Multi –cylinder engine	Practice on unserviceable diesel engine – removing jammed nuts, broken studs and reconditioning damaged threaded holes – removing cylinder head, connecting rods and pistons, cleaning, inspecting and refitting them, Writing reports of damaged parts and repairs to be carried out on engine,
The four stroke and two stroke diesel engine – uniflow and loop scavenging constant pressure and constant volume cycles. Diesel cycle indicator diagrams.	Practice in starting and stopping of stationery and a transport vehicle engine, General maintenance of engines – checking oil, fuel, water levels and accessories of diesel engines
Specification of diesel engine . Materials used for different engine parts , working clearances , compression ratios – valve timing of diesel engines crankshaft , connecting rods, piston , valves and valve operation . The combustion chambers – types , advantages and disadvantages ,. Heater plugs – types uses	Removing cylinder head, pistons connecting rods, cleaning, decarbonising and cylinder head checking, piston clearance, dismantling valve assemble , cleaning , checking and reconditioning valves , assembling valves and adjusting tappet clearances, assembling engine parts and starting the engine after repairs and adjusting slow speeds.

Fuels used in diesel engine specification of diesel fuels importance of clean fuel general layout of the fuel feed system in the stationary and transport diesel Engine	Bleeding fuel lines for Air locks. Repairing fuel leaks in the pipe – lines and unions. Cleaning of oil and Air Filters in diesel engine
Types of fuel injection systems – air injection and air less injection . Fuel feed pumps – Description Operation – Common Troubles And Remedies	Cleaning and servicing of primary fuel filters and pressure , stage filters – removing feed pump – dismantling, cleaning , reassembling refitting and testing and feed pump
Need for governors types pneumatric and mechanical governors. The pumps phasing and calibration of pumps. Checking and fixing injection timings. Governors types their description and operation. Starting and adjusting slow speed.	Dismantling an unserviceable fuel injection pump clearing inspecting, studying parts and reassembling. Removing F.I pump from running engine changing oil in it cutting back to engine testing the governor and setting injection timing.
Injector nozzles- types description, operation testing of injectors. Special; features of pintle nozzles.	Testing injection for missing on the vehicle-removing, dismantling, cleaning, inspecting – replacing defective parts – reassembling the injectors and testing them.
Need for governors- types- pneumatic and mechanical governors, maintenance of governors reason for black, white and blue smoke in exhaust.	Trouble shooting with special reference to adjustments in the fuel feed system- checking exhaust gases- and adjusting the governor slow speed adjustment and venturi control adjustments. Checking oil, fuel water and exhaust gas leaks and correcting them.
Timing of injection in single cylinder engine.flange type pumps and their special features. Care and maintenance of single cylinder pumps.	Further practice on cleaning and servicing of injectors, adjustment of tappets and setting injection timing in engines(Both stationary and transport vehicles engines.
	Electrical/ Electronic Accessories Repair Work
Description of light circuits and different components in light circuits- description and function of each. Prefocussed bubles and sealed beams. Fuses and their importance.	Studying the light circuit- test bulbs, align head lamps, find out short and open circuits in the light wiring- replacing fuses testing the tail and brake lights in vehicle.
Electric horn circuit- description of electric horn- operation of relay and horn switches. Common troubles and their remedies.	Removing and electrical horn from vehicle-dismantling.,cleaning point, testing wires, assembling the horn and adjusting the horn for correct sound, tuning double horn, repairing of horn relay and horn switches.
Description and operation of electric wiper motor care and maintenance. Common troubles and remedies.	Removing a wiper motor dismantling, cleaning, inspecting, repairing electrical wiper motors, assembling and fitting, setting blades for correct functioning.
Flasher circuit its description and operation common, troubles in the circuit and remedies .magnetors ignition system- description and operation advantages rotating armature and flywheel magnetos special features.	Studying the wiring circuit of traffic signal flasher light circuit tracing defects in the tracing defects in the flasher circuit replacing fuse bulb.removing dismantling cleaning and assembling magnetos-adjusting gap in points- testing magnetos.

Description and operation of alternators in vehicle. Advantages of using alternators. Common troubles and remedies.	Studying the alternators in vehicle- removing and refitting alternator in vehicle precautions to be observed while connecting battery in alternation circuit. General maitanence,adjusting fan belt play/ tension
Positive and negative earthing of battery- advantages and precautions. Electrical measuring meters their use care and maintenance.	Further practice in dismasntling cleaning, testing and reassembling of starter motor and generators . overhauling of distributor assembly.
Iucas- color code for wiring in the ; motor vehicles. Binary numbers logic gates, amplifiers and multi vibrators.	Trouble tracing in electrical wiring of the vehicle. Use of resistance meter, voltmeter and ammeter. Attending mechanical repairs to electrical accessories such as fuel gauge, temprature gauge, brake light switch, and solenoid switch.
Principle of electronic ignition advantages types of electronic ignition system as capacitor discharge ignition system thyristor based ignition system and microprocessor based contactless ignition system.	Tracing fault in different electronic ignition systems and rectification
	Driving Practice
<u>Motor vehicle Act :</u> Driving road rules – Road traffic signals – hand signals. Precautions to be taken while overtaking, reversing driving through narrow lanes, curves and slopes.	Practice in straight driving on wide roads. Driving through lanes and curves. Practice in reversing. Practice overtaking another vehicle. Practice in driving through sand and wet surface. Practice in parking vehicles, paralled parking and diagonal parking. Practice in driving over slope and down hill. Practice in driving over narrow bridges.
	Synchromesh Gear Box and Transfer Case 4 Wheel Drive Prepare Work
Synchromesh gear boxes – advantages – description , operation in different gear positions. Common trouble and remedies. Types of Synchromesh gear boxes- their special features.	Dismantling a Synchromesh gear box- cleaning, inspecting parts replacing worn out defective parts – assembling and testing for correct performance, identifying noises from gear box and rectifying.
Description and operation of 4 wheel drive. The purpose of transfer case and the arrangement of shifting mechanism. Common troubles and remedies.	Removing transfer case from the vehicle – dismentling, cleaning, inspecting parts, replacing worn/ damaged parts, re-assembling, testing and fitting. Repairing of 4 wheel drive shifter mechanism. Overhauling of front wheel drive propeller shaft unit.
Systematic procedure of locating noises from the transmission units – common troubles in the system and their remedies.	Trouble shooting in the transmission system identifying the noises from clutch, assembly, gearbox, universal joints- rear axle drive and the differential unit. Checking oil leaks and correcting.

	Engine Fault Dygnosis Including Engine Scaning
Different types of noises coming from engine – bearing knock, gudgeons pin knock, pinging, tappet noise, chipping noise.	Diagnosing noises and faults in engine and rectifying them – checking under carriage noises and rectifying them. Road testing vehicle.
Introduction to engine tuning, study engine torque, fuel consumption, duel angle exhaust gases etc.	Test Duel angle, Engine tuning and exhaust gases analysis. Demonstration of engine efficiency with the help of Dynamometer
	Servicestation Equipments And Wheel Balancing
Garage equipment construction and operation of air compressor, spark plug tester, valve refacer, injector tester, drilling machine care and maintenance.	Repairs of jacks, grease guns, oil spray guns, other spray guns and other shop floor equipment. Care and maintenance and lubrication of air compressor, valve refacer, drilling machine, injector tester , spark plug tester.
Importance of wheel balancing. Details of equipment and method.	Wheel balancing and use of equipment.
	Car Air Conditioning System Repair and Maintenance
Introduction to Air conditioning system in Motor vehicle. Compatibility of Air conditioning system with vehicle engine.	Fitting and repairing air conditioning unit in motor vehicle. Tuning engine with respect to the Air conditioning.

List of Tools and Equipment

Sr.No.	Description
	Tool Kit
1.	Hammer ball peen 0.75 kg
2.	Chisel cold flat 19mm
3.	Center punch 1mm dia x 100mm
4.	Steel rule 15 cm english and metric
5.	Screw driver 30 cm x 9mm blade
6.	Screw driver 20 cm x 9 mm blade
7.	Spanner D.E.set of 12 pieces(omm-32mm)
8.	Plier combination 15cm
9.	Hand file 20cm second cut
10.	Feeler gauge 20 blade(metric)
11.	Ring spanner set of 12 pieces(omm-32mm)
12.	Steel tool box with lock and key (folding type) size 400x 200x150 mm
13.	Allen key set of 12 pieces (2mm- 14mm)
14.	Circlip plier(ext. and int) 150 mm and 200 (two each)
15.	Philips screw driver type sets of 5 pieces100- 300 mm

Tools, Measuring Instrunment and General Shop Out Fit:-

1.	Rule steel 300 mm
2.	Divider spring joints150 mm
3.	Prick punch 15 cm
4.	Chisel cross cut 200 mm x 6mm
5.	Hammer ball peen 0.5 kg
6	Hammer copper 1 kg with handle
7	Engineers square 15 cm blade
8	Scriber 15 cm
9	Scriber block universal
10	Marking out tables 90 x 60 x 90 cm (high)
11	Surface plate 60 x60 cm
12	Hacksaw frame for 30 cm blade
13	'V' block 75 x 38 mm pair with clamps
14	Punch, hollow, 6, 7, 8, 9, 10.5 & 12mm set
15	Punch figure set 3 mm
16	Punch letters set 3mm
17	Hand vice 37 mm
18	Screw driver, electrician type 15 cm size
19	File, flat 35 cm bastand
20	File, flat 25 cm second cut
21	File flat 20 cm smooth
22	File, flat safe edge 25 cm smooth
23	File, triangular 15 cm second cut

24	File half round 20 cm second cut
25	File, square 30 cm rough
26	File square 20 cm second cut
27	Twist drill , metric 3 mm to 12 mm(1mm step)
28	Taps and dies complete sets in box metric with handle
29	Hand reamer, adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 mm to 14.25 mm & 14.25mm to 15.75 mm
30	Scrapper flat 25 cm
31	Scrapper triangular 25 cm
32	Scrapper half round 25 cm
33	Sets of mores socket MT 0.1,1.2 & 2.3
34	Micrometer outside 25- 50 mm
35	Micrometer outside 0- 25 mm
36	Micrometer out side 50 – 75 mm
37	Micrometer outside 75 – 100 mm
38	MICROMETER inside 50 –75 mm & 150mm & 25 mm & 150 mm
39	Vernier caliper 200 mm inside, outside depth
40	Safety goggles
41	Hammer planishing
42	Setting hammer
43	Mallet (wooden)
44	Trammel 30 cm
45	Blow lamp 0.5 liter
46	Soldering iron 120 watts
47	Pliers nose (round and straight) 150 mm and 200 mm
48	Soldering iron copper 225 gms (fire hated 150 mm and 200 mm)
49	Snip straight 250 mm
50	Spanner double ended set of 12 metric size 6 to 32 mm
51	Spanner off set double ended set of 6 pcs. (6mm to 17 mm)
52	Double open ended ignition spanner set of 15 (0 to 9 mm)
53	Spanner adjustable 20 cm
54	Spanner ring of set of six(sae)
55	Spanner for sparking plug 14 mm
56	Magneto spanner set of 8 spanner
57	Spanner socket set 6-32 mm sockets (complete set)
58	Spanner T. Flex for screwing up and unscrewing in accessible position
59	Double open ended tappet spanner
60	Drift copper 10mm dia x 150mm
61	Spray Gun- Kerosene
62	Pressure grease gun
63	Chain pulley block –3 ton capacity
64	Tray cleaning 45x30 cm
65	Drilling machine(bench) 12 mm dia
66	Oil can 0.5 liter
67	Lifter, valve spring
68	Tool, valve grinding suction type(consumable tool)

69	Valve seat cutting tools complete with guides and pilot bar(all angles) in a box
70	Extractor, stud 'ezy out' type
71	Compression gauge to read 17.6 kg/ sq.cm
72	Vacuum gauge 0 to 75 cm
73	Stone, carborandom 15x 5x3.75 cm rough and smooth
74	Cylinder dial gauge
75	Torque wrench(0 to 67.5 kg meter) set of 3
76	Work bench240x 120x 75 cm with 4 vices 12.5 cm jaw
77	Lockers with 8 drawers (standard size)
78	Metal rack 180x 150x 45 cm
79	Fuel pump
80	Distributor)old for practice
81	Carburetor(two different types)
82	Water pump and oil pump
83	Filling jig for adjusting the piston ring gap
84	Steel almirah 180x 90 x50 CMS
85	Blackboard 180x90cm
86	Desk or table 90x 60 cm(for Instructor)
87	Fire extinguisher
88	Fire bucket with stand
89	Tachnometer
90	Jack, hydraulic Hi- Lift type(trolley type)
91	Tester sparking plug NEON type
92	Compressor air piston type(vehicular)
93	Wheel alignment gauge magnetic type with turn tables
94	Sectionised engine gear box and differential mounted on chassis
95	Brake assembly , master cylinder, wheel cylinder and servo
96	Vacuum assisted hydraulics brake assembly with vacuum booster
97	Air brake assembly
98	Brake lining rivetting machine(foot operated)
99	Clutches, different types such as cone type, disc type, diaphragm type etc.
100	Axle, gear boxes steering boxes fount axle assembly independent front wheel spring assembly
101	Full floating axle and semi floating axle assembly
102	Steering assembly – rack and pinion type
103	Steering assembly- power steering
104	Spring tension scale- 0-4.5 kg
105	Valve spring compressor
106	Carburettor repair tool kit
107	Puller set steering wheel universal
108	Puller set universal bearing and bushes
109	Lifting jack, screw type-
110	Coil spring compressor for suspension spring
111	Hot patch clomp

112	Piston ring compressor
113	Valve key inserter
114	Wall charts(driving instructions)
115	Connecting road alignment fixture
116	Valve refacer
117	Piston ring expander
118	High rate discharge tester
119	A.V.O meter
120	Pneumatic tools
121	Impact screw driver
122	General purpose puller
123	Stud extractor
124	Spring plier 150, 200,mm
125	Torque wrench (set of three)nos.
126	Growler
127	Battery charger
128	Timing light
129	Hydrometer
130	Continuity meter
131	Tyre changer

General machinary:-

1.	Grinder with two :7" wheels with twist drill grinding attachment
2 .	Arbor press hand operated ½ ton
3.	Motor vehicle in running condition (diesel heavy)
4.	Motor car in running condition(petrol)
5.	Light commercial vehicle- old 3 ton
6.	Heavy commercial vehicle
7.	Petrol engine (running condition,car type)
8.	Diesel the running type condition
9.	Petrol engine(2 strokes) motor cycle/ scooter
10.	Spark plug cleaning and testing equipment
11.	Air compressor- 2 stage- 500 litre with 5 hp motor and air receiver
12.	Mechanical hoist/ plate form type

List of Tools and Equipment

A] General Class room

Sr	Name of Item	No.
1	Steel lockers 8 compartments with individual lockers (1980 x 910 x 480 mm)	4
2	Chair with writing pad	25
3	Steel almari with self 6.5' x 3' (18 gauge)	2
4	Steel table 4' x 3'	2
5	Teacher chair	2

B] For Computer Fundamental and CAD Practical

Sr	Name of Item	No.
1	Computer System P4 with accessories Complete with license OS. Compatible for- to run AutoCAD 2010 and Windows 7 OS.	5+1
2	Plotter- HP Design Jet 500 latest model	1
3	Scanner	1
4	Computer table	5+2
5	Chair for computer	10+2
6	Laser Printer	1
7	AutoCAD 2010 or above Software	1
8	M. S. Office Software	1
9	Pro- Engineering –V-4 Student Version	1
10	CATIA R-17 – Evolution Student Version	1

List of Equipments / Machinery :

Sr. No.	Name of the Equipment/ Machinery	Nos.
1	TRAINEES TOOL KIT	5
2	Try Square 10 cm Blade	5
3	Calipers outside 15 cm spring	5
4	Caliper inside 15 cm spring	5
5	Dividers 15 cm Spring	5
6	Calipers 15 cm Hermaphrodite	5
7	Scriber 15 cm	5
8	Punch center 10 cm	5
9	Screw driver 15 cm	5
10	Chisel cold 20 cm	5
11	Trammel 30 cm	5
12	Hammer ball peen 0.5 kg with handle	5
13	Hammer Mallet	5
14	Hammer Plastic	5
15	Hammer ball peen 0.5 kg with handle	5
16	File flat 25 cm second cut	5
17	File flat 25 cm second cut	5
18	Hacksaw frame adjustable 20-30 cm	5
19	Dot slot punch	5
20	Steel rule 15 cm English and metric	5
21	Steel rule 30 cm English and metric	5
22	Try square 20 cm Blade	5
23	Steel tool box	5
24	Scriber	5
25	Lock and keys	5
26	Combination plier	5
27	Jenny calipers	5
28	Aluminum tray 15 cm X 10 cm	5
29	Fellow polish cloth standard size	5

	Shop Outfit & Measuring Instruments	
30	Straight edge 45 cm X 45 cm	1
31	Marking table 90X90 cm	1
32	Surface plate 45 cm X 45 cm	1
33	Vee Block pair 7 cm and 15 cm with clamps	1
34	Angle plate 10 X 20cm	1
35	Number Punch 3 mm set	2
36	letter Punch 3 mm set	2
37	Round punch 3 mm X 4 mm set of 2	2
38	File flat 20 cm bastard	2
39	Oil Stone 15 X 5 cm X 2.5 cm	
40	Spanner adjustable 10 cm	1
41	Chisel cold 20 cm cross cut	2
42	Chisel 10 cm flat	2
43	Drill twist 1.5 mm to 15mm (various sizes) by 0.5	2
44	Files assorted sizes and type including safe edge	10
45	Micrometer inside 50-150 mm with screen	2
46	Bench Vice 12 cm jaw	5
47	Work Bench 240 X 120 60 mm with screen	3
48	Drill point angle gauge	1
49	Vernier Calipers 20 cm	2
50	Vernier height gauge 30 cm	1
51	Huntington and diamond dresser	1
52	Taps and dies complete set (metric)	2 set
53	Hacksaw frame	5
54	Fire buckets with stand	1
55	Thread pitch gauge metric, BSX, BSF, MC, MF & SAE	1 each
56	D.E. spanner ser of 12 metric 6 mm to 32 mm	1 set
57	Ring spanner set at 12 metric 6 mm to 32	1 set
58	Stud extractor set of 3	1 set
59	Universal puller for removing pulleys, bearings	1 set
60	Unserviceable engine/gear box rear axle	1
61	Stud remover with socket handle	1
62	Combination pliers 15 cm	5
63	Depth guage (inch and metric	1
64	Screw pinch gauge (inch and metric)	1 set
65	Feeler gauge 20 blades (inch and metric)	1
66	Aluminum tray 45 X 30 mm	5
67	Oil can 0.5 liter capacity	1
68	Surface gauge	1
69	Cylinder bore gauge (mercer)	1
70	Telescopic gauge	1
71	Steel measuring tape 10 meter in a case	2
72	Sets of Morse socket MT 0-1,1-2,and 2-3	1 set
73	Blow lamp	1
74	Torque wrenches 5-35 Nm,12-68 Nm&50-225 Nm.	1 each

75	Outside micrometer English 0-1,1-2,2-3,3-4,4-5,And 5-6 inches	1 each
76	Micrometer outside 1 to 25 mm,25mmto 50mm ,50 to75 mm,75 to100mm,100 to 125mm,125 to 150mm.	1
77	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	1
78	Printed wall chart framed for display showing measuring instruments.	10
79	Inside micrometer English 2" to 6" with extension road	1
80	Vernier bevel protractor (metric and inch)	1
81	Vernier calipers (inch and metric) 6"x12"	1
82	Vernier micrometers(inch and metric)	1
83	Vernier height gauge 150 mm height (inch and metric)	1
84	Dial micrometer (inch and metric)	1
85	Small bore gauge (standard)	1
86	Dial test indicator to read (inch an metric)0.02mm	1
	General Installatoin /Machineries	
87	Radial Drilling Machine 25mm capacity	1
88	Power Hacksaw	1
89	Rotary Cut off Machine	1
90	Shaping machine	1
91	Hydraulic Press 2 ton capacity	1
92	Surface plate (small)	1
93	Surface plate (big)	1
94	Standard Arc Welding machine	1
95	Horizontal milling machine	1
96	Bench Drilling machine 6-12mm cap Motorized with chuck and key	1
97	Grinding machine (general purpose)D.E. pedestal with 300mm dia wheels rough and smooth	1
98	Hydraulic Trainer with Power pack	1
99	Pneumatic Trainer	1
	Workshop Furniture	
100	Suitable Work Tables with vices As required	1
101	Stools 25 Nos	25
102	Tool Cabinet 2 nos	2
103	Trainees locker 2 nos	2
104	Fire fighting equipment , first aid box etc As required	1
105	Book shelf (glass panel) 1 nos	1
106	Storage Rack As required	2
107	Storage shelf As required	2

List of Books

Machine Drawing

1] N.D.Bhatt Elements of Engineering Drawing 49TH 2005 Charotar publishing house,opposite Amul dairy, court road Anand India

2] N.D.Bhatt Machine Drawing 40TH 2005 Charotar publishing house,opposite Amul dairy, court Road Anand India

Computer Fundamental

1] Vikas Gupta Comdex Computer Course Kit First Dreamtech
2] Henry Lucas Information Technology for management 7Th Tata Mc-Graw Hills
3] B.Ram Computer Fundamentals Architecture and Organisation Revised 3rd New Age International Publisher

CAD Books

1] Reference Manual of AutoCAD AutoDesk
2] Reference Manual of Felix cad Felix CAD
3] Reference Manual of Intel CAD
4] Reference Manual of Auto Civil
5] Reference Manual of 3D-Max

List of Books –

1. M. N. Uppal A Text - book of ngineering Chemistry
2. V. P. Mehta A Text - book of polytechnic Chemistry
3. Banswal, Mahajan and Mehta A Text - book of,Applied Chemistry
4. Hazra Choudhary Elements,of workshop technology
5. S.K.Hajra Choudhary Elements of workshop technology Vol-I First 1964 Media promoters & Publisher pvt. Ltd.
6. Mahajan Mechanical Technology Third 1989 Vrinda publication

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