

ABOUT THE COURSE

In the Vocational Higher secondary Education (VHSE) system the department offers two courses related to automobile industry. They are Maintenance and Repairs of Two Wheelers and Three Wheelers (MRTWTW) and Maintenance and Repairs of Automobile (MRA). Currently these two courses are merged and renamed as Automobile Technology (AT). This endeavor will definitely enhance the job opportunities of our students. Moreover the higher educations at this diploma and degree level are based on automobile technology. In the new curriculum, we have tried to incorporate the Concept and ideas of modern systems and components of automobile.

Automobile industry is a fast developing field all over the world. Automobile technology has much scope in India. This is one of the fastest growing engineering sectors. On the increasing demand of cars, bike and other automobile vehicles, the companies show their full interest to set up companies in various states of India. Many foreign car companies are competing each other to set up their firms in India. As India is the second largest country in population of the world, it gives a huge marketing scope. The different types of millions of vehicles have to be maintained in trouble less smooth condition. It gives plenty of job opportunities. As a fast growing country India is facing acute shortage of large number of skilled workers. After completing Automobile Technology course in Vocational Higher Secondary, the students will get easily access in the various posts of industry in automobile sector. The course is designed to grab opportunities in the present global crisis situation.

Students having a basic knowledge and practice in Automobile Engineering will have a lot of opportunities in India and abroad. Automobile Technology is a course which is designed to expertise the students in the service and maintenance of automobile. This course has four modules and each module helps the student to understand the various areas of an automobile. Each module is designed to acquire some specific skills as per the Industrial need. The duration of one module is 340 hours, thirty percentages is allotted to theory and seventy percentage to practical. Moreover four weeks OJT is also facilitated to our students for acquiring the strategies and skills of a real work situation. Due to the growth in automobile sector, the job opportunities are also growing. There are lot of opportunities in the area of Manufacturing, service station, transport companies, defense service, private sector and so on. The Automobile Technology course is designed as per NSQF norms. Moreover it covers all basic Automobile Technologies in foreman skill level. It is specially designed to support the students especially those who are going for higher education.

FOR JOB ROLES (CAREER PATH)

The Automobile Technology course offers plenty of job opportunities in different sectors of industry, like Automotive Mechanic, Auto Electrician Diesel Mechanic, etc. Some of them are listed below

GOVT/SEMI GOVT SECTOR

1. Motor Mechanic
2. Lab Technical Assistant
3. Motor Mechanic in KSRTC
4. Mechanic in KSEB

PRIVATE SECTOR

1. Automotive Electrician
2. Service Mechanic
3. Spare parts Operator Executive
4. Auto Service Technician
5. Customer Relation Executive
6. Auto engine Technician
7. Automobile Sales Executives
8. Tyres Retreading Operator
9. Diesel fuel Calibration Technician
10. Survey Assistant
11. Automobile Body Work
12. Automobile Painting Workshop
13. Wheel Balancing Center

SELF EMPLOYMENT

1. Service Centre
2. Auto Electrical Service Centre
3. Spare Parts Centre
4. Automobile Consultant
5. Automobile Sale Consultant
6. Tyres Puncture Repair Shop
7. Tyres Retreading
8. Body workshop
9. Upholstery Work
10. Water Service Center

11. Wheel Balancing Center

12. Auto Paint Shop

SUBJECT APPROACH

Automobile is the fast developing engineering segment all over the world. It gives a wide range of job opportunities. The Indian automobile industry is amongst the largest automobile market in the world. It is up-and-coming as one of the fastest growing passenger car market. It is also the second largest two wheeler manufacturer country in the world. India is also the fifth largest commercial vehicle manufacturer.

This syllabus, for automobile Technology course in Vocational Higher Secondary Schools is prepared by State Council of Educational Research and Training (SCERT). Head of schools, Vocational Teachers, Instructors, Industrial Experts, Subject Experts and Curriculum Committee Members.

This subject aims at helping students to understand and aware where technology is applied in the field of automobile. Students will be given opportunities to learn the concept and knowledge in the technological world and to build up technical capability through learning activities. The area of learning provided in the subject should not be confined not only to the local automobile sales and repair but also provide self-employment and vertical mobility in the field concerned.

For smooth implementation of subject additional resources will be procured to support the teaching and learning activities. A well-equipped automobile workshop with sophisticated equipments and tools are essential for it. This syllabus is prepared to cop up with level 3 and 4 of NSQF (National Skill Qualification Framework). The content and the time duration for theory and practical works are provided as per NSQF norms. It helps our students to compete with international community.

Aims of the course

The new syllabus should enable the students to:

1. Acquire knowledge and understand the technology, related to contemporary automobile industry.
2. Initiate ideas creatively and develop the idea as potential solutions to problems with the use of their knowledge and experience.
3. Explain and evaluate various constructions and functions of automobile, and apply the knowledge to practical fault-finding and diagnostic situation.

4. Develop the construction, maintenance, repair and technological capability through the process of investigation, planning, execution and evaluation in an orderly and effective manner.
5. Develop communication skill to interpret and present ideas through oral, written and other media.
6. Exercise value judgment regarding the social, economic and environmental implication of automobile technology and industry in the society.
7. Transfer and apply the knowledge and concept gained in other similar contest.
8. Be aware of road safety and traffic rules.
9. Be aware of health and safety measures in operations

Linkages with industry

Linking territory institutions to industries is inevitable. We are adopting school based vocational education. The institution must have a partner to help for finding solutions and this can be accomplished only by developing linkage with industries. So that they can survive and accomplish their intended goals of providing the skilled man power needs of the country.

The department of Vocational Higher Secondary Education should take initiative to make an MOU between government and industry. Regional level officer should be there to ensure the smooth conduct of industry linkage program. Our new curriculum proposes to conduct four week on the job training during the course. So a systematic well-structured industry linkage program is essential.

Entrepreneurial values

One of the major objectives of the vocational Higher Secondary Education is self-employment. In the automobile Technology sector we have ample opportunities for it. The students learn basic technologies of automobile and acquire vocational skills through practical classes. More over four weeks On the Job Training enable them to be a good Technician. The students also master entrepreneurial skill when they learn the subject "Entrepreneurship Development" during the 2 year course. This subject helps them to acquire communicative skills and soft skills. The government of Kerala has launched "Kerala State Entrepreneur Development Mission (KSEDM) for inculcating entrepreneurial confidence among the youth of the state. Thus programs from different agencies will help our students to become good entrepreneurs.

ICT Enabled Education

Information Communication Technology has a vital role in automobile technology. The students can easily grasp the content through videos, slides etc. IT@ School has helped all VHS schools to set up good laboratories. This will improve the quality of teaching learning process. The working of different component like engine, gear box, clutches, different systems etc. can easily transacted through videos.

SYLLABUS

MODULE 1 - AUTOMOTIVE CHASSIS

UNIT 1.1 Introduction to Automobiles

Definition of Automobile-History of Automobile-Classification of Automobile-Purpose, Capacity, Fuel used, Number of wheels, Drive of vehicle-Technical Specification of Vehicle. Definition of - Wheel base, Wheel track ground clearance, Turning radius, Kerb weight, Gross vehicle weight, Engine Power, Engine Torque.

UNIT 1.2 Engineering Drawing

Drawing standards- Lettering and Numbering-Dimensioning-Projection of Points-Projection of Lines-Projection of Planes-Orthographic Projection of Objects-Sectional views-Isometric views

UNIT 1.3 Chassis and Suspension

Layout of Automobile-Basic idea of Automobile systems-Types of Chassis frame and body-Monocoque Structure Tube, Channels and Box-Need and functions of suspension system-Sprung & Unsprung Weight-Classification of Suspension system-Rigid axle -Independent suspension construction and working of Mc-Pherson strut- suspension system construction and working of wishbone type suspension system-construction and working of Air suspension-Different types of springs-Leaf spring with helper spring-Coil spring-Torsion bars-Dampers/ Shock Absorbers-Classification and Working of Dampers-Pitching, Bouncing and Rolling- Stabilizer bar (Anti-Roll Bar)

UNIT 1.4 Front Axles and Steering

Live axle and Dead axle-Stub Axles-Classification-Elliot, Reverse Elliot and Lemoine-Construction of Reverse Elliot Type-Steering Geometry-Camber, Caster angle, King pin inclination, Toe-in, Toe- out-Study of steering components-steering wheels, steering column, steering Gearbox, tie-rod, track rod arm, steering knuckle, pitman arm ,drag link-Steering gearbox-Construction and working of Rack and Pinion. Steering gearbox- construction and working of Recirculating ball type-Steering gear ratio-Power steering -Hydraulic Power steering, Linkage

type power steering , Integral power steering-familiarization of Electronic power steering-Wheel Alignment and Wheel Balancing

UNIT 1.5 Wheels and Tyres

Function of Wheels & tyres-Types of wheels, Wire wheel, Disc wheel, Alloy wheels-Types of tyres, Tubed Tyres, Tubeless tyre-Constructional details of tyres & Comparison, Tubed, Tubeless tyres, Bias ply Radial ply, Merits and demerits-Specification of wheels and tyres-Tyre designation-Over inflation and Under inflation of tyres -Tyre Defects and remedies

UNIT 1.6 Brakes

Functions and Necessity of Brakes-Classification of Brakes-Purpose, Construction, Method of Actuation, Location, Extra Braking Effort-Construction and working of Drum brakes-Types of Disc brake-fixed caliper type, sliding caliper type, swinging caliper type-layout and working of Hydraulic Brake System-Construction and working of Tandem master cylinder-Construction and working of Wheel cylinder-Vacuum Booster- Layout and working of Air Brake-Construction and working of Brake valve-Construction and working of Brake chamber-Brake fluid-Function of Proportionating valve-Advanced brake systems Concept of ABS (Anti-Lock Brake System) & EBD (Electronic Brake Distribution)

MODULE 2 - AUTOMOTIVE ENGINES

UNIT 2.1 Engine fundamentals

IC engine and EC engines-Classification of IC engine-Spark Ignition, Compression Ignition-Engine Terminology-TDC, BDC, Stroke, Bore, Clearance volume, Piston displacement, Compression ratio, Engine capacity, Indicated Horse Power, Brake Horse Power, Frictional Horse Power, Mean Effective Pressure, Mechanical efficiency, Thermal efficiency, Volumetric efficiency-Working of 2 stroke petrol engine-Working of 4 stroke Petrol engine-Working of 4 stroke Diesel engine-Comparison between 2 stroke and 4 stroke Petrol engine-Comparison between Petrol and Diesel engines

UNIT 2.2 Engine constructions

Cylinder block-Cylinder head-Oil sump-Cylinder liner-Wet liner ,Dry liner-Gaskets-Manifolds-Inlet manifolds, Exhaust manifolds-Mufflers-Piston assembly-Piston, Piston rings, Gudgeon pin-Piston clearance-Gudgeon pin connecting methods-Full floating, Semi floating ,stationery-Connecting rod-Crank shaft-Fly wheel-Ring gear- Cam shaft-Timing gears, Timing sprocket and chains, Timing pulley and belts-Engine Bearings-Main bearings, Thrust bearing -Valve -Side valve mechanism -Overhead valve mechanism-Valve clearance -Single Over Head Camshaft& Double Over Head Camshaft Mechanisms-Variable Valve Timing mechanisms

UNIT 2.3 Petrol Fuel systems

Types of fuel system-Gravity feed system, Pressure feed system-Layout and working of pressure feed system-Air cleaner, Fuel tank, Fuel filter, Fuel pump, Carburetor, Fuel gauge-Construction and working of Air cleaners-Dry type air cleaners, Oil bath type air cleaners-Types of fuel pumps-mechanical, electrical -Construction and working of electrical fuel pump-Fuel filters-cartridge type fuel filters-Working of simple carburetor-Air fuel ratio-rich mixture, lean mixture, stoichiometric-Layout and working of Multi Point Fuel Injection system (MPFI)-Function of ECU-Name and functions of Sensors

UNIT 2.4 Diesel Fuel system

Layout and working of Individual pump system-working of Distributor type injection pump-Working of Common rail direct injection system (CRDI)-Components of diesel fuel system-Injectors, Nozzles-diesel fuel filters-Governors (concept only)-Mechanical, Pneumatic, Electronic-Glow plugs and De-compressors-Alternate fuel vehicles-LPG, CNG, Electric, Hybrid cars-Turbocharger

UNIT 2.5 Cooling Systems

Necessity and methods of cooling system-Air Cooling, Liquid Cooling-Functions of cooling system-Working of Air cooling system-Working of Pump circulation system-Cooling system components- construction, working and function of- Radiator, water pump, Thermostat valve, Pressure cap, Expansion reservoir, Cooling fan-Troubles and remedies of cooling system-Coolant-Additives, Anti-Freeze solution

UNIT 2.6 Lubrication Systems

Necessity and functions of Lubrication system-Grading of Lubricants-SAE grade-Types of lubricating system-petrol system, Splash system, pressure system, Dry Sump System-Working of pressure feed lubrication system-Components of Lubrication system-Oil strainer, Oil pump, Oil filter, Oil gallery -Construction and working of Rotor type oil pump-Oil filtering methods-Full flow system, Bypass flow system.

LEARNING OUTCOMES

After completion of two modules the learner will be achieve the following learning outcomes.

MODULE 1. AUTOMOTIVE CHASSIS

UNIT 1.1 Introduction to Automobiles

- 1.1.1 Explain the concept of automobile
- 1.1.2 Explain basic Idea of evolution of automobile and try to Investigate more ideas about It
- 1.1.3 Categorize the vehicles based on classification of automobile
 - Purpose
 - Capacity
 - Fuel used
 - Number of wheels
 - Drive of vehicle
- 1.1.4 Using the manual define the Technical specification of Vehicle
 - Wheel base
 - Wheel track
 - Ground Clearance
 - Turning radius
 - Kerb weight
 - Gross vehicle weight
 - Engine power
 - Engine Tork

UNIT 1.2 Engineering Drawing

- 1.2.1 Use various drawing standards in appropriate situations
- 1.2.2 Do proper lettering and numbering while preparing drawing sheets
- 1.2.3 Use proper dimensioning method
- 1.2.4 Use proper angle of Projection to project points
- 1.2.5 Use proper angle of Projection to project lines
- 1.2.6 Use proper angle of Projection to project planes
- 1.2.7 Do drawing of objects using orthographic projection methods
- 1.2.8 Do drawing sectional view of an object
- 1.2.9 Do drawing isometric views of an object

UNIT 1.3 Chassis and Suspension

- 1.3.1 Identify and locate various components of automobile
- 1.3.2 Identify, locate and explain the functions of various automobile systems
- 1.3.3 Classify and compare chassis frame and body of different automobiles
- 1.3.4 Identify the needs and functions of suspension system
- 1.3.5 Differentiate Sprung and Unsprung weight in suspension system
- 1.3.6 classify suspension systems into rigid axle and independent suspension system and explain its merits and demerits
- 1.3.7 Explain the construction and working of Mc- Pherson strut type
- 1.3.8 Explain the construction and working of wish bone type suspension system
- 1.3.9 Explain the working and layout of Air suspension system
- 1.3.10 Classify different types of springs and explain its merits and demerits
- 1.3.11 Identify and locate various springs, leaf spring with helper spring, coil spring torsion bar
- 1.3.12 Explain the constructional details and working of various springs
- 1.3.13 Identify and locate various Dampers
- 1.3.14 Explain the constructional details and working of Telescopic Dampers
- 1.3.15 Explain various situations of Pitching, Bouncing and Rolling of vehicle
- 1.3.16 Explain the usage and functions of Stabilizer bar

UNIT 1.4 Front Axles and Steering

- 1.4.1 Differentiate between live and dead axle
- 1.4.2 Classify and describe the function stub axles
- 1.4.3 Explain the construction of Reverse Elliot type stub axle
- 1.4.4 Explain the need and functions of various terms of steering geometry
 - Camber angle
 - Caster angle
 - King pin inclination
 - Toe-in
 - Toe- out

- 1.4.5 Identify, locate and explain the functions of the steering components
- steering wheels
 - steering column
 - steering Gearbox
 - tie-rod
 - track rod arm
 - steering knuckle
 - pitman arm
 - drag link
- 1.4.6 Explain the construction and working of rack and pinion type steering gear box and describe the Merits and demerits
- 1.4.7 Explain the construction and working of recirculating ball type steering gear box and describe the merits and demerits
- 1.4.8 Calculate steering gear ratio
- 1.4.9 Explain the concept about power steering
- 1.4.10 Classify various types of power steering
- 1.4.11 Explain the working of linkage type power steering through block diagram
- 1.4.12 Explain the concept of Wheel Alignment and Wheel Balancing
- 1.4.13 Explain the advantages of Wheel Alignment and Wheel Balancing

UNIT 1.5 Wheels and Tyres

- 1.5.1 Describe the functions of wheels & Tyres
- 1.5.2 Classify various types of Wheels
- 1.5.3 Describe the construction and functions of different types of wheels and compare merits and demerits
- 1.5.4 Explain the various types of Tyres and compare its merits and demerits
- 1.5.5 Describe the construction and function of different types of Tyres and compare its merits and Demerits
- 1.5.6 Illustrate wheels and tyre designation
- 1.5.7 Distinguish between over inflation and under inflation
- 1.5.8 List the important Tyre Defects and explain the remedial measures

UNIT 1.6 Brakes

- 1.6.1 Explain Functions and necessity of Brakes

- 1.6.2 Classify Brakes based on
 - Purpose
 - Construction
 - Method of Actuation
 - Location
 - Extra Braking Effort
- 1.6.3 Describe the construction and working of Drum Brakes
- 1.6.4 Identify different types of Disc Brakes
 - fixed calliper type
 - sliding calliper type
 - swinging calliper type
- 1.6.5 Explain construction and working of sliding caliper type disc Brakes, describe its merits and Demerits and compare it with drum brakes
- 1.6.6 Describe the layout and working of Hydraulic Brake System
- 1.6.7 Describe the construction and working of Tandem Master cylinder
- 1.6.8 Describe the construction and working of Wheel cylinder
- 1.6.9 Explain the need and working of Vacuum Booster
- 1.6.10 Describe the layout and working of Air Brakes
- 1.6.11 Describe the construction and working of Brakes valve
- 1.6.12 Describe construction and working of brake chamber
- 1.6.13 List the Properties and Grading (dot1,dot2,dot3,dot4)of different Brake Fluids
- 1.6.14 Explain the function of Proportionating Valve
- 1.6.15 Describe Working of ABS and EBD and state the merits and demerits

MODULE 2- AUTOMOTIVE ENGINES

UNIT2.1 Engine fundamentals

- 2.1.1 Distinguish IC engine and EC engine
- 2.1.2 Classify IC engines into SI and CI engine with sub classification
- 2.1.3 Define and explain Various Engine Terminologies
 - TDC
 - BDC
 - Stroke
 - Bore

- Clearance volume
- Piston displacement
- Compression ratio
- Engine capacity
- Indicated Horse Power
- Brake Horse Power
- Frictional Horse Power
- Mean Effective Pressure
- Mechanical efficiency
- Thermal efficiency
- Volumetric efficiency

2.1.4 Explain the working of 2 stroke petrol engine

2.1.5 Explain the working of 4 stroke petrol engine

2.1.6 Explain the working of 4 stroke diesel engine

2.1.7 Compare 2 stroke and 4 stroke petrol engine

2.1.8 Compare petrol and diesel engine

UNIT 2.2 Engine constructions

2.2.1 Identify and locate the cylinder block

2.2.2 Explain the constructional details and function of the cylinder block

2.2.3 Identify and locate the cylinder head

2.2.4 Explain the constructional details and function of the cylinder head

2.2.5 Identify and locate the oil pan

2.2.6 Explain the constructional details and function of the Oil pan

2.2.7 Identify, locate and distinguish the cylinder liner

2.2.8 Explain the constructional details and function of the cylinder liners

2.2.9 Identify and locate the different gaskets

2.2.10 Explain the constructional details and function of the gasket

2.2.11 Identify and locate the manifolds

2.2.12 Describe the constructional details and function of the manifolds

2.2.13 Identify and locate muffler

- 2.2.14 List different types of mufflers
- 2.2.15 Explain the constructional details and function of the muffler
- 2.2.16 Identify and locate
 - Piston
 - Piston rings
 - Gudgeon pin
- 2.2.17 Explain the constructional details and functions of
 - Piston
 - Piston rings
 - Gudgeon pin
- 2.2.18 Explain the need and necessity of piston clearance
- 2.2.19 Describe different connecting methods of gudgeon pin
- 2.2.20 Identify and locate the connecting rod
- 2.2.21 Describe the constructional details and function of the connecting rod
- 2.2.22 Identify and locate the crankshaft
- 2.2.23 Explain the constructional details and function of the crankshaft
- 2.2.24 Identify and locate the flywheel
- 2.2.25 Explain the constructional details and function of the flywheel
- 2.2.26 Identify and locate the camshaft
- 2.2.27 Explain the constructional details and function of the camshaft
- 2.2.28 Identify and locate components- timing gears, timing sprocket and chain, timing belt and pulley
- 2.2.29 Explain the constructional details and functions of the timing gears, timing sprocket and chain, timing belt and pulley
- 2.2.30 Identify and locate the bearings
- 2.2.31 Describe the constructioned details and function of the engine bearings.
- 2.2.32 Identify and locate the engine valves
- 2.2.33 Explain the constructional details and function of the poppet valves
- 2.2.34 Explain the construction and working of side valve mechanism
- 2.2.35 Explain the construction and working of overhead valve mechanism

- 2.2.36 Define valve clearance
- 2.2.37 Explain the necessity of valve clearance
- 2.2.38 Describe the constructional details and function of Single Over Head Camshaft
- 2.2.39 Describe the constructional details and function of double Over Head Camshaft
- 2.2.40 State the function and merits of the VVT mechanisms

UNIT 2.3 Petrol Fuel system

- 2.3.1 List the types of fuel system
 - Gravity feed system
 - Pressure feed system
- 2.3.2 Explain the working of pressure feed system
- 2.3.3 Identify the components and explain its functions
 - Air cleaner
 - Fuel tank
 - Fuel filter
 - Fuel pump
 - Carburetor
 - Fuel gauge
- 2.3.4 Explain different types of air cleaners and its construction
- 2.3.5 Explain the working of oil bath type air cleaners
- 2.3.6 Differentiate mechanical and electrical fuel pump and list the merits and demerits of it
- 2.3.7 Explain the construction and working of electrical fuel pump
- 2.3.8 Explain the working of cartridge type Fuel Filter
- 2.3.9 Explain the working of Simple Carburetor
- 2.3.10 Describe various mixture strengths used in Petrol Engines and states its necessity
- 2.3.11 Explain working and layout of MPFI system
- 2.3.12 Discuss the name and functions of ECU and different sensors used in MPFI system

UNIT 2.4 Diesel Fuel system

- 2.4.1 Explain the working of individual pump diesel fuel system
- 2.4.2 Explain working of distributor type fuel pump
- 2.4.3 Explain working of CRDI and list its advantages

- 2.4.4 Describe the functions of various Components of diesel fuel system
 - Injectors
 - Nozzles
 - diesel fuel filters
- 2.4.5 Identify different types of Governors and state its necessity in Diesel fuel system
- 2.4.6 Explain the functions of Glow plugs and De-compressors
- 2.4.7 Explain the concept and identify the necessity of Alternate fuel vehicles
- 2.4.8 Explain the layout and working of turbocharger

UNIT 2.5 Cooling System

- 2.5.1 Explain necessity and different methods of Cooling system in engines
- 2.5.2 Describe various functions of cooling system
- 2.5.3 Explain the working of air cooling system
- 2.5.4 Explain working of Pump circulation system and compare it with other cooling systems used in automotive engines
- 2.5.5 Describe the construction working and functions of cooling system components
 - Radiator
 - Water pump
 - Thermostat valve
 - Pressure cap
 - Expansion reservoir
 - Cooling fan
- 2.5.6 List Troubles and remedies of cooling system
- 2.5.7 Explain the properties and advantages of coolant over water

UNIT 2.6 Lubrication System

- 2.6.1 Explain the necessity and functions of Lubrication system
- 2.6.2 Explain SAE grade in grading of Lubricants
- 2.6.3 List different types of lubricating System and Compare various lubrication systems
- 2.6.4 Explain the working of pressure feed lubrication system
- 2.6.5 Identify the components and functions of various component

in lubrication system

2.6.6 Explain construction and working of Rotor type oil pump

2.6.7 Explain working of the different oil filtering methods and compare the full flow and bypass flow system

SCHEME OF WORK

The course is divided into the following four modules. Each module is of six months duration.

MODULE 1 AUTOMOTIVE CHASSIS TOTAL PERIODS- 340

Month	Unit No.	Name of Units	Periods
June	1.1	Introduction to Automobile	20
	1.2	Basic Engineering Drawing	30
	1.3	Chassis and Suspension	18
July	1.3	Chassis and Suspension	68
August	1.4	Front axle and Steering	63
	1.5	Wheels and Tyres	5
September	1.5	Wheels and Tyres	36
	1.6	Brakes	32
October	1.6	Brakes	58
	Assessment		10

MODULE 2 AUTOMOTIVE ENGINES TOTAL PERIODS- 340

Month	Unit No.	Name of Units	Periods
November	2.1	Engine Fundamentals	54
	2.2	Engine Construction	14
December	2.2	Engine Construction	58
	2.3	Petrol fuel system	10
January	2.3	Petrol fuel system	52
	2.4	Diesel fuel system	16
February	2.4	Diesel fuel system	32
	2.5	Cooling system	36
March	2.5	Cooling system	7
	2.6	Lubrication system	51

COURSE STRUCTURE

The course is divided into the following four modules. Each module is of six months duration.

SI .No	Name of Module	Total periods
Module 1	Automotive chassis	340
Module 2	Automotive engines	340
Module 3	Automotive transmission systems	340
Module 4	Automotive electrical systems	340

CLASS ROOM ACTIVITIES

Product presentation through PowerPoint

- Exhibitions
- Charts
- Diagrams
- Animated CDs
- Group Discussions
- Debate
- Seminar
- Prepare questionnaire
- Assignment
- Interview
- Project
- Demonstration
- Quiz
- Survey

VOCATIONAL SKILL

- Observation skill
- Analyzing skill
- Familiarizing skill
- Classification skill

- Comparative skill
- Drawing skill
- Marking skill
- Dimensioning skill
- Measuring skill
- Calculating skill
- Deriving skill
- Cleanliness skill
- Diagnosing skill
- Tolerance skill
- Experimenting skill
- Numerical ability skill
- Co-ordination skill

Practical Activity

- practical works
- Interaction with Industrial experts
- Collection
- Model preparation
- Industrial visit
- Case study
- OJT
- Survey

ON THE JOB TRAINING

On the job training is also called direct instruction. It is one-on-one training located at the job site, where someone who knows how to do a task shows another how to perform it. It is often inexpensive because no special equipment is needed other than what is normally used on the job. The important features of On the Job training are as follows

- OJT helps the students to achieve practical experience along with theoretical study
- OJT gives opportunity to the student to directly view and get experience the various practical works included in the syllabus
- OJT creates awareness about the discipline, punctuality and

security precautions while working in an Industrial environment
The advice, Practical instruction and explanations given by the experienced mechanic increases the knowledge level of the students

- The theory classes conducted along with OJT helps the students to understand the subject in depth and detail
- OJT also helps the students to get knowledge in marketing strategies, customer relation, front office management, inventory control, advanced technologies, Spare parts management and familiarize special tools and equipment.

As far as automobile technology course is concerned, it is not much difficult to find institutions for On the Job training. In most of the localities, it is easy to find well equipped automobile workshops. Anyway in some rural areas it is difficult to facilitate institutions as they are far from the school. The department of Vocational Higher Secondary should take initiation to make an MOU between Govt. and industries in this regards. KSRTC, Defense sector and various reputed vehicle dealers etc. should come under this agreement. The depart is planning to conduct in the first year two weeks and in the second year two week, (altogether four weeks) during the two year course. It can be conduct one week after the completion of each module or two weeks in first and second year. The time of the OJT can be fixed as per the decision of the SRG

Certification of skills in each module

- Certificate in Automotive Chassis Maintenance Skill
- Certificate in Automotive Engine Mechanic
- Certificate in Automotive Transmission Troubleshooting Skill
- Certificate in Automotive Electrician

OVERVIEW OF MODULE - 1

This module creates an awareness of the history and evolution of automobile through various stages, classification of automobiles and its Technical specifications. The students can identify different types of vehicle of and its use, get the concept of chassis and its types on which the vehicle body is built and learn the construction, working and practical experience on different suspension system, shock absorber, front axle and steering mechanisms. The different types of wheels and tyres used in an automobile are also dealt with this module. The classification

and working of different brakes, their use and modern advanced system are also discussed. Basic engineering graphics techniques like lettering, dimensioning, projection etc, are also explain in this module.

MODULE 1

Automotive Chassis: 340Periods

Unit No.	Name of Units	Periods
1.1	Introduction to Automobile	20
1.2	Basic Engineering Drawing	30
1.3	Chassis And Suspension	88
1.4	Front Axle And Steering	65
1.5	Wheels And Tyres	43
1.6	Brakes	94
	Assessment	10
	Total Periods	340

30% periods - theory sessions and 70% periods - practical activities

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.1: Introduction to Automobile (20 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Definition of Automobile History of Automobile <ul style="list-style-type: none"> • Observing • Analysing 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain the concept of Automobile • Explain basic idea of evolution of Automobile and try to investigate more ideas about it. 	<ul style="list-style-type: none"> • Visual Media • Slide show • Chart • Collecting Information and presentation(group work) 	<ul style="list-style-type: none"> • Identification list • Questionnaire • Chart showing evolution of automobile • Questionnaire • Quiz • Assignment(CE)
Classification of Automobile <ul style="list-style-type: none"> • Purpose • Capacity • Fuel used • Number of wheels • Drive of vehicle 	<p>Categorize the vehicles based on Classification of Automobile</p> <ul style="list-style-type: none"> • Purpose • Capacity • Fuel used • Number of wheels • Drive of vehicle 	<ul style="list-style-type: none"> • Survey (group work)of vehicles • Visual Media 	<ul style="list-style-type: none"> • Debate • Chart • Questionnaire
SKILLS <ul style="list-style-type: none"> • Observation skill • Comparison skill • Analytical skill 			
Technical Specification of Vehicle SKILLS <ul style="list-style-type: none"> • Observation skill • Comparison skill • Analytical skill • Skill of charting 	<ul style="list-style-type: none"> • , define the Technical Specification of Vehicle using the manual 	<ul style="list-style-type: none"> • Chart showing vehicle specification Manual • Collection of technical specification from manual(group work) 	<ul style="list-style-type: none"> • Quiz • Questionnaire • Product evaluation

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.2 : Basic Engineering Drawing(30 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Drawing standards SKILLS <ul style="list-style-type: none"> Drawing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Use various Drawing Standards in appropriate situations 	<ul style="list-style-type: none"> Demonstration of drawing standards Collecting Information of drawing standards Discussion 	<ul style="list-style-type: none"> Preparation of note on drawing standards Activity log Collecting Information Questionnaire Manual
Lettering and Numbering SKILLS <ul style="list-style-type: none"> Drawing skill 	<ul style="list-style-type: none"> Do proper lettering and Numbering while preparing drawing sheets 	<ul style="list-style-type: none"> Demonstration of lettering and numbering 	<ul style="list-style-type: none"> Lettering and numbering using various fonts -Activity log
Dimensioning SKILLS <ul style="list-style-type: none"> Drawing skill 	<ul style="list-style-type: none"> Use proper Dimensioning method 	<ul style="list-style-type: none"> Demonstration of dimensioning 	<ul style="list-style-type: none"> Activity log
Projection of Points SKILLS <ul style="list-style-type: none"> Drawing skill 	<ul style="list-style-type: none"> Use proper angle of Projection to project points 	<ul style="list-style-type: none"> Demonstration of projection of points Drawing practice 	<ul style="list-style-type: none"> Activity log
Projection of Lines SKILLS <ul style="list-style-type: none"> Drawing skill 	<ul style="list-style-type: none"> Use proper angle of Projection to project lines 	<ul style="list-style-type: none"> Demonstration of projection of lines Diagram preparation 	<ul style="list-style-type: none"> Activity log
Projection of Planes SKILLS <ul style="list-style-type: none"> Drawing skill 	<ul style="list-style-type: none"> Use proper angle of Projection to project planes 	<ul style="list-style-type: none"> Demonstration of projection of planes Discussion Drawing practice 	<ul style="list-style-type: none"> Activity log Evaluation of drawing sheets (Portfolio work)

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.3 : Basic Engineering Drawing(30 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Orthographic Projection of Objects SKILLS</p> <ul style="list-style-type: none"> • Drawing skill • Analytical skill • Imaginative skill <p>Sectional views SKILLS</p> <ul style="list-style-type: none"> • Drawing skill • Visualisation • Analytical skill • Imaginative skill <p>Isometric views SKILLS</p> <ul style="list-style-type: none"> • Observation skill • Comparison skill • Analytical skill • Imaginative skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Do drawings of objects using Orthographic Projection methods • Do drawing of Sectional View of an object • Do drawing of Isometric views of an object 	<ul style="list-style-type: none"> • Demonstration of orthographic projection • Drawing practice • Demonstration of sectional views of objects • Drawing practice • Demonstration of isometric view of objects • Drawing practice 	<ul style="list-style-type: none"> • Evaluation of drawing sheets (Portfolio work) • Lettering and numbering using various fonts -Activity log • Evaluation of drawing sheets (Portfolio work) • Evaluation of drawing sheets (Portfolio work)

Unit 1.3: Chassis and Suspension(88 periods)

Module 1 : AUTOMOTIVE CHASSIS

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Layout of Automobiles</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Drawing skill • Observation skill • Presentation skill • Classification Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Identify and locate various components of automobile 	<ul style="list-style-type: none"> • Chart Preparation of layout of automobiles • Demonstration using Multimedia • Demonstration in actual situations 	<ul style="list-style-type: none"> • Practical evaluation • Activity Log • Questionnaire
<p>Basic idea of Automobile systems</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Learning skill • Observation Skill • Practical Skill 	<ul style="list-style-type: none"> • Identify , locate and explain the functions of various automobile systems 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Demonstration in actual situations 	<ul style="list-style-type: none"> • Practical evaluation • Activity Log
<p>Types of Chassis frame and body</p> <ul style="list-style-type: none"> • Monocoque Structure • Construction Tubes, Channels, Box 	<ul style="list-style-type: none"> • Classify and compare chassis frame and body of different automobiles 	<ul style="list-style-type: none"> • Multimedia presentation of different chassis frames and body • Actual Demonstration of different chassis frames 	<ul style="list-style-type: none"> • Activity log • Classification Chart
<p>SKILLS</p> <ul style="list-style-type: none"> • Observation Skill • Drawing skill 	<ul style="list-style-type: none"> • Identify the Needs and functions of Suspension System 	<ul style="list-style-type: none"> • functions of suspension system • Demonstration 	<ul style="list-style-type: none"> • Activity log • Questionnaire
<p>Need and functions of suspension system.</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Drawing Skill 	<ul style="list-style-type: none"> • Identify the Needs and functions of Suspension System 	<ul style="list-style-type: none"> • functions of suspension system • Demonstration 	<ul style="list-style-type: none"> • Activity log • Questionnaire

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.3: Chassis and Suspension(88 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Sprung &Unsprung Weight SKILLS <ul style="list-style-type: none"> • Technical Skill • Observation skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Differentiate Sprung and Unsprung Weight 	<ul style="list-style-type: none"> • Debate on sprung weight and Unsprung weight • Demonstration • Visual Media 	<ul style="list-style-type: none"> • Questionnaire • Presentation • Activity log
Classification of Suspension system <ul style="list-style-type: none"> • Rigid axle • Independent suspension SKILLS <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Observation skill • Drawing Skill 	<ul style="list-style-type: none"> • classify Suspension Systems into rigid axle and independent suspension system and explain its merits and demerits 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Actual demo • Seminar 	<ul style="list-style-type: none"> • Activity log • Practical assessment
Construction and working of Mc-Pherson strut type suspension system SKILLS <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Observation skill • Drawing Skill 	<ul style="list-style-type: none"> • Explain the construction and working of Mc- Pherson strut type suspension system 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Actual demo of vehicle using Mc-Pherson strut suspension system 	<ul style="list-style-type: none"> • Activity log • Practical assessment
Construction and working of wishbone type suspension system SKILLS <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Observation skill • Drawing Skill 	<ul style="list-style-type: none"> • Explain the construction and working of Wishbone type suspension system 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Actual demo of vehicle using Wishbone type suspension system • Seminar on construction and working of Wishbone type suspension system 	<ul style="list-style-type: none"> • Activity log • Practical assessment

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.3 : Chassis and Suspension (88 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>construction and working of Air suspension</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Observation skill • Drawing Skill <p>Different types of springs</p> <ul style="list-style-type: none"> • Leaf spring with helper spring • Coil spring • Torsion bars <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Practical Skill • Observation Skill <p>Dampers/Shock Absorbers</p> <ul style="list-style-type: none"> • Classification • Working of Dampers <p>SKILLS</p> <ul style="list-style-type: none"> • Observation Skill • Analysis Skill • Classification Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain the working and layout of Air Suspension System • Classify different types of springs and explain its merits and demerits • Identify and locate various springs- Leaf spring with helper spring, Coil spring, Torsion bars • Explain the constructional details and working of various springs • Identify and locate various Dampers • Explain the constructional details and working of Telescopic Dampers 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Actual demo • Seminar on construction and working of Air suspension • Actual demo of different types of springs • Demonstration of different types of springs • Visual Media • Actual demo of dampers/Shock Absorbers • Demonstration using Visual Media 	<ul style="list-style-type: none"> • Activity log • Practical assessment • Seminar report • Practical evaluation • Questionnaire • Diagram • Practical evaluation • Questionnaire • Diagram

Module 1 : AUTOMOTIVE CHASSIS			
Unit 1.3: Chassis and Suspension(88 periods)			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Pitching, Bouncing and Rolling SKILLS</p> <ul style="list-style-type: none"> • Observation Skill • Analysis Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain various situations of Pitching, Bouncing and Rolling of vehicle 	<ul style="list-style-type: none"> • Demonstration using Multimedia of Pitching, Bouncing and Rolling 	<ul style="list-style-type: none"> • Questionnaire • Activity log
<p>Stabilizer bar (Anti-Roll Bar) SKILLS</p> <ul style="list-style-type: none"> • Observation Skill 	<ul style="list-style-type: none"> • Explain the usage and functions of Stabilizer bar 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Discussion on usage and functions of Stabilizer bar 	<ul style="list-style-type: none"> • Questionnaire • Activity log

Module 1 : AUTOMOTIVE CHASSIS Unit 1.4: Front Axle And Steering(65 periods)

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Live axle and Dead axle SKILLS</p> <ul style="list-style-type: none"> ● Observation Skills ● Technical Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> ● Differentiate between live and dead axle 	<ul style="list-style-type: none"> ● Actual demo ● Demonstration using Multimedia 	<ul style="list-style-type: none"> ● Practical evaluation ● Questionnaire
<p>Stub Axles</p> <ul style="list-style-type: none"> ● Classification-elliot, reverse Elliot and lemoine ● construction of reverse Elliot type <p>SKILLS</p> <ul style="list-style-type: none"> ● Classifying Skill ● Observation Skills 	<ul style="list-style-type: none"> ● Classify and explain the function of Stub Axle ● Explain the construction of Reverse Elliot type Stub Axle 	<ul style="list-style-type: none"> ● Actual demo ● Demonstration using Multimedia 	<ul style="list-style-type: none"> ● Practical evaluation ● Questionnaire
<p>Steering Geometry</p> <ul style="list-style-type: none"> ● Camber angle ● caster angle ● king pin inclination ● toe-in ● toe- out <p>SKILLS</p> <ul style="list-style-type: none"> ● Technical Skill ● Experimenting Skill ● Observation Skill ● Analysing Skill 	<ul style="list-style-type: none"> ● Explain the need and functions of various terms of steering geometry ● Camber ● Caster angle ● king pin inclination ● toe-in ● toe- out 	<ul style="list-style-type: none"> ● Demonstration using Multimedia ● Project on steering geometry 	<ul style="list-style-type: none"> ● Practical evaluation ● Questionnaire

Module 1 : AUTOMOTIVE CHASSIS Unit 1.4: Front Axle And Steering(65 periods)

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Study of steering components</p> <ul style="list-style-type: none"> steering wheels steering column steering Gearbox tie-rod track rod arm steering knuckle pitman arm drag link <p>SKILLS</p> <ul style="list-style-type: none"> Observation Skill Analysing Skill Practical Skill <p>Steering gearbox</p> <ul style="list-style-type: none"> Construction and working of Rack and Pinion <p>SKILLS</p> <ul style="list-style-type: none"> Recirculating Skill Experimenting Skill Analysing Skill <p>Construction and working of ball type steering gearbox</p> <p>Steering gear ratio</p> <ul style="list-style-type: none"> Calculate steering gear ratio <p>SKILLS</p> <ul style="list-style-type: none"> Classification Skill Experimenting Skill Analysing Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Identify, locate and explain the functions of the steering components steering wheels steering column steering Gearbox tie-rod track rod arm steering knuckle pitman arm drag link <ul style="list-style-type: none"> Explain the construction and working of Rack and Pinion type steering gear box and describe the merits and demerits <ul style="list-style-type: none"> Explain the construction and working of recirculating ball type steering gearbox. 	<ul style="list-style-type: none"> Actual demo of steering components Demonstration using Multimedia <ul style="list-style-type: none"> Demonstration using Multimedia Actual demo of rack and pinion steering gear box <ul style="list-style-type: none"> Actual demo of Recirculating ball type steering gearbox Actual demo Discussion on steering gear ratio 	<ul style="list-style-type: none"> Practical evaluation Questionnaire <ul style="list-style-type: none"> Practical evaluation Questionnaire <ul style="list-style-type: none"> Practical evaluation Questionnaire Activity log <ul style="list-style-type: none"> Practical evaluation Questionnaire Activity log

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.4: Front Axle And Steering(65 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Power steering</p> <ul style="list-style-type: none"> Hydraulic Power steering Linkage type power steering Integral power steering familiarization of Electronic power steering , <p>SKILLS</p> <ul style="list-style-type: none"> Analysing Skill Observation Skill Classification Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Explain the concept about Power Steering classify various types of Power Steering Explain the working of linkage type power steering through block diagram 	<ul style="list-style-type: none"> Discussion on different types of power steering mechanisms Demonstration with multimedia Actual demo 	<ul style="list-style-type: none"> Diagram Debate Questionnaire Practical evaluation
<p>Wheel Alignment and Wheel Balancing</p> <p>SKILLS</p> <ul style="list-style-type: none"> Analysing Skill Observation Skill Experimenting Skill 	<ul style="list-style-type: none"> Explain the concept of Wheel Alignment and wheel Balancing Explain the advantages of Wheel Alignment and Wheel Balancing 	<ul style="list-style-type: none"> Experiment Demonstration using Multimedia Actual demo on wheel alignment and wheel balancing 	<ul style="list-style-type: none"> Practical evaluation Activity log Debate Questionnaire Viewing

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.5: Wheels and Tyres(43 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Function of Wheels & tyres</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Analysing Skill • Observation Skill <p>Types of wheels</p> <ul style="list-style-type: none"> • Wire wheel/spoke wheel • Disc wheel • Alloy wheels <p>SKILLS</p> <ul style="list-style-type: none"> • Classifying Skill • Observation Skill <p>Types of Tyer</p> <ul style="list-style-type: none"> • Tubed Tyres • Tubeless tyre • Bias ply • Radial ply <p>SKILLS</p> <ul style="list-style-type: none"> • Classifying Skill • Observation Skill • Experimenting Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • describe the functions of wheels &Tyres • Classify various types of Wheels <ul style="list-style-type: none"> • Wire wheel/spoke wheel • Disc wheel • Alloy wheels • Describe the functions and construction of different types of wheel and compare merits and demerits • Explain the various types tyres and compare its merits and demerits. 	<ul style="list-style-type: none"> • Presentation by the teacher and Discussion • Actual demo on different types of wheels • Demonstration using Multimedia • Actual demo • Demonstration using Multimedia • Seminar on types of tyres • Visit to a workplace 	<ul style="list-style-type: none"> • Activity log • Activity Log • Quiz(group activity) • Activity log • Report of visit

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.5 : Wheels and Tyres (43 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Constructional details of tyres.</p> <p>Comparison merits and demerits</p> <ul style="list-style-type: none"> • Tubed and Tubeless tyres • Bias ply and Radical ply <p>SKILLS</p> <ul style="list-style-type: none"> • Classifying Skill • Observation Skill • Experimenting Skill <p>Specification of wheels and tyres</p> <ul style="list-style-type: none"> • Tyre designation <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill <p>Over inflation and Under inflation of tyres</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Observation Skill • Technical Skill <p>Tyre Defects and remedies</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Observation Skill • Technical Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • describe the construction and function of different types of Tyres and Compare its merits and Demerits • Illustrate Wheels and Tyres designation • Distinguish between over inflation and under inflation • List the important Tyre Defects and explain the remedial measures 	<ul style="list-style-type: none"> • Actual demo • Demonstration using Multimedia • Actual demo • Demonstration using Multimedia • Collecting Information from Manual • Actual demo • Demonstration using Multimedia • Discussion • Collecting Information of inflation of different vehicles • Actual demo • Demonstration using Multimedia • Discussion • Collecting pictures of different defects 	<ul style="list-style-type: none"> • Activity log • Practical evaluation • Activity Log • Report • Activity Log • Report • Portfolio (Album) • Activity log

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.6 : Brakes (94 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Functions and Necessity of Brakes</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill <p>Classification of Brakes</p> <ul style="list-style-type: none"> • Purpose • Construction • Method of Actuation • Location • Extra Braking Effort <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill <p>Construction and working of Drum brakes</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain the functions and necessity of Brakes • Classify Brakes based on <ul style="list-style-type: none"> • Purpose • Construction • Method of Actuation • Location • Extra Braking Effort • Describe the construction and working of Drum Brakes 	<ul style="list-style-type: none"> • Group Discussion on functions and necessity of brakes • Discussion • Demonstration using multimedia • Classification chart • Project on classification of brakes • Demonstration using Multimedia • Actual demo • Diagram of drum brakes 	<ul style="list-style-type: none"> • Activity log • Flow diagram • Activity Log • Portfolio (Diagram) • Activity log

Module 1 : AUTOMOTIVE CHASSIS		Unit : Brakes 1.6 (94 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Types of disc brake</p> <ul style="list-style-type: none"> • fixed calliper type • sliding calliper type • swinging calliper type <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Identify different types of Disc Brakes <ul style="list-style-type: none"> • fixed calliper type • sliding calliper type • swinging calliper type • Explain construction and working of sliding calliper type disc Brakes, describe its merits and Demerits and compare it with drum brakes 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Actual demo • Diagram of fixed, sliding and swinging calliper type disc brake 	<ul style="list-style-type: none"> • Portfolio(Diagram) • Activity log • Practical evaluation
<p>Layout and working of Hydraulic Brake System</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<ul style="list-style-type: none"> • describe the layout and working of hydraulic brake system. 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion • Seminar on hydraulic brake system 	<ul style="list-style-type: none"> • Diagram • Activity log
<p>Construction and working of tandem master cylinder</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<ul style="list-style-type: none"> • describe the construction and working of Tandem Master cylinder 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion on tandem master cylinder • Practical 	<ul style="list-style-type: none"> • Diagram • Activity log • Practical evaluation

Unit 1.6 : Brakes (94 periods)			
Module 1 : AUTOMOTIVE CHASSIS	Learning Outcomes	Suggested Activities	Assessment
Construction and working of wheel cylinder SKILLS <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • describe the construction and working of Wheel cylinder 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion on wheel cylinder • Practical 	<ul style="list-style-type: none"> • Diagram • Activity log • Practical evaluation
Vacuum Booster SKILLS <ul style="list-style-type: none"> • Vacuum Booster 	<ul style="list-style-type: none"> • Explain the need and working of Vacuum Booster 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion on vacuum booster 	<ul style="list-style-type: none"> • Activity log
Layout and working of Air Brake SKILLS <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<ul style="list-style-type: none"> • Describe the layout and working of Air Brakes 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia of layout of air brake • Discussion on air brake 	<ul style="list-style-type: none"> • Activity log
Construction and working of brake valve SKILLS <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<ul style="list-style-type: none"> • Describe the construction and working of Brakes valve 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion on brake valve • Diagram 	<ul style="list-style-type: none"> • Activity log • Practical evaluation
Construction and working of brake chamber SKILLS <ul style="list-style-type: none"> • Technical Skill • Observation Skill 	<ul style="list-style-type: none"> • describe construction and working of brake chamber 	<ul style="list-style-type: none"> • Actual demo • Demonstration with multimedia • Discussion • Diagram of brake chamber 	<ul style="list-style-type: none"> • Activity log • Practical evaluation

Module 1 : AUTOMOTIVE CHASSIS		Unit 1.6: Brakes (94 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Brake fluid SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill <p>Function of Proportionating valve SKILLS</p> <ul style="list-style-type: none"> • Function of Proportionating valve <p>Advanced brake systems</p> <ul style="list-style-type: none"> • Concept of ABS(Anti-Lock Brake System)& EBD (Electronic Brake Distribution) <p>SKILLS</p> <ul style="list-style-type: none"> • Technical Skill • Observation Skill • Classifying Skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • List the Properties and Grading (dot1,dot2,dot3,dot4)of Brake Fluids • Explain the function of Proportionating Valve • Describe the layout and working of Air Brakes • Describe Working of ABS and EBD and state the merits and demerits 	<ul style="list-style-type: none"> • Demonstration using Multimedia • Chart • Assignment on properties and grading of different brake fluid • Demonstration with multimedia • Discussion on functions of proportionating valve • Diagram • Demonstration using Multimedia of ABS and EBD 	<ul style="list-style-type: none"> • Collecting Information • Questionnaire • Activity log • Assignment • Activity log • Questionnaire • Activity log

PRACTICALS ACTIVITIES OF MODULE - I

Unit - 1 - Introduction to Automobile

1. Personal safety and machine safety
2. Identification and application of measuring tools
3. Identification and application of machine Tools
4. Cutting practice
5. Drilling practice
6. Filing practice
7. Tapping And Dyeing

Unit - 2 - Basic Engineering Drawing

1. Drawing standards
2. Lettering numbering and dimensioning
3. Projection of points
4. Projection of lines
5. Orthographic projection of objects
6. Sectional views
7. Isometric view

Unit - 3 - Chasis and Suspension

1. Checking of frame alignment
2. Servicing of shock absorber
3. Servicing of leaf spring assembly
4. Servicing of Telescopic front fork
5. Inspection of chasis frame.
6. Care and maintenance suspension system
7. Trouble shooting of suspension system.

Unit - 4 - Front axle and Steering

1. Overhauling of steering gearbox
2. Calculating steering gear ratio
3. Checking of steering alignment
4. Checking of Caster angle, Camber angle, Toe-in, Toe-out and King pin inclination
5. Care and maintenance of steering system
6. Trouble Shooting of steering system

Unit - 5 - Wheels and Tyres

1. Tyre changing
2. Vulcanization
3. Tyre rotation
4. Cold patching method
5. Care and maintenance of tyre

6 Trouble shooting of tyre.

Unit - 6 Brake

1. Brake adjustments
2. Brake bleeding
3. Overhauling of Master cylinder
4. Overhauling of Wheel cylinder
5. Maintenance of Air brake
6. Care and maintenance of brake
7. Trouble shooting of brake

MODEL QUESTION PAPERS OF MODULE 1

1.1 Introduction To Automobiles

1. List automobiles from the following
(car, bullock cart, jeep, boat, helicopter, tractor, scooter)
2. Raju was travelling through a city, he saw many kinds of automobile vehicles there. He wish to categorize these vehicles. Help him to categorize vehicles according to different methods

1.2 Basic Engineering Drawing

1.3 Chassis And Suspension

1. In a particular suspension system the tilt of one wheel will not affect the other.
 - a) Name the suspension system
 - b) Explain the construction and working of any one of the system
2. Following are different components of automobile. Classify them as sprung and Unsprung weight.
(wheel, spring , engine, axle, wheel cylinder, master cylinder, clutch, gear box)

1.4 Front Axle And Steering

1. The tilt of front wheel from vertical is called_____
2. As a part of field visit you and your group visited a wheel balancing and wheel alignment center. Prepare a note about wheel alignment and wheel balancing and their merits.

1.5 Wheels And Tyres

1. The part of the tyre which comes in contact with road surface is called _____

2. In a tyre the centre portion worn more than that of sides.
 - a) Write the term associated with it
 - b) Define the term.

1.6 Brakes

1. A debate is conducted in the classroom about " disc brake is better than drum brake". Make some arguments in and against that topic.
2. When you are dismantling the tandem master cylinder your friend noticed that the fluid reservoir is connected to pressure chamber through two ports.
 - a) Tell the names of two ports
 - b) Mention the reason for having two ports.

OVERVIEW OF MODULE - 2

This module deals with engine fundamentals and engine construction. The students can classify the engine under the areas of different headings and understand the working. The basic engine terminology and construction of different parts are also included in this module. The students can understand the layout, components and working of Petrol fuel systems and Diesel fuel systems. This module also describe the necessity, function, types and working of cooling systems used in an automobile. Different types of coolant, troubles and remedies of cooling systems are also discussed in this module. Students also go through the necessity, function and working of lubricating system.

MODULE 2

AUTOMOTIVE ENGINES : 340 PERIODS

Unit No.	Name of units	Periods
2.1	Engine fundamentals	56
2.2	Engine construction	74
2.3	Petrol Fuel system	64
2.4	Diesel Fuel system	49
2.5	Cooling System	44
2.6	Lubrication System	53
	Total Periods	340

30% periods - theory sessions and 70% periods - practical activities

Module 2 : AUTOMOTIVE ENGINES		Unit 2.1 : Engine Fundamentals (56 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>IC engine And EC engines</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Observation skill • Comparison skill <p>Classification of IC engine</p> <ul style="list-style-type: none"> • Spark Ignition • Compression Ignition <p>SKILLS</p> <ul style="list-style-type: none"> • Classifying skill • Observation skill <p>Engine Terminology</p> <ul style="list-style-type: none"> • TDC, BDC, Stroke, Bore • clearance volume • piston displacement • compression ratio • engine capacity • Indicated Horse Power • Brake Horse Power • Frictional Horse Power • Mean Effective Pressure • Mechanical efficiency • Thermal efficiency • volumetric efficiency <p>SKILLS</p> <ul style="list-style-type: none"> • Identification skill • Deriving skill • Calculating skill • Observation skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • distinguish IC engine and EC engine • Classify IC engines into SI and CI engine with sub classification • define and explain Various Engine Terminologies • TDC, BDC, Stroke, Bore • clearance volume • piston displacement • compression ratio • engine capacity • Indicated Horse Power • Brake Horse Power • Frictional Horse Power • Mean Effective Pressure • Mechanical efficiency • Thermal efficiency • volumetric efficiency 	<ul style="list-style-type: none"> • Discussion on IC and EC engines • Brain storming • Demonstration using Multimedia • Discussion • Classification chart • Survey (group work) of different types of engine according to classification • Visual Media • Actual demo • Demonstration using Multimedia • Seminar on engine terminology 	<ul style="list-style-type: none"> • Activity log • Quiz • Chart presentation • Activity log • Activity log • Practical evaluation • Seminar report

Module 2 : AUTOMOTIVE ENGINES		Unit 2.1 : Engine Fundamentals (56 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Working of 2 stroke petrol engine</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Analyzing skill • Experimental skill • Drawing skills 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain the working of 2 stroke petrol engine 	<ul style="list-style-type: none"> • Demonstration using Multimedia on working of 2 stroke petrol engine • Actual demo 	<ul style="list-style-type: none"> • Activity log
<p>Working of 4 stroke Petrol engine</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Analyzing skill • Experimental skill • Drawing skills 	<ul style="list-style-type: none"> • Explain the working of 4 stroke petrol engine 	<ul style="list-style-type: none"> • Demonstration using Multimedia on working of 4 stroke Petrol engine • Actual demo 	<ul style="list-style-type: none"> • Activity log • Project report
<p>Working of 4 stroke Diesel engine</p> <ul style="list-style-type: none"> • Analyzing skill • Experimental skill • Drawing skills <p>SKILLS</p> <ul style="list-style-type: none"> • Identification skill • Deriving skill • Calculating skill • Observation skill 	<ul style="list-style-type: none"> • Explain the working of 4 stroke diesel engine 	<ul style="list-style-type: none"> • Demonstration using Multimedia on working of 4 stroke Diesel engine • Actual demo on working of 4 stroke Diesel engine 	<ul style="list-style-type: none"> • Activity log • Questionnaire • Practical evaluation

Module 2 : AUTOMOTIVE ENGINES		Unit 2.1 : Engine Fundamentals 56 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Comparison between 2 stroke and 4 stroke petrol engine</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Comparison skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • compare 2 stroke and 4 stroke petrol engine 	<ul style="list-style-type: none"> • Comparison Chart of 2 stroke and 4 stroke petrol engine • Group discussion on comparison between 2 stroke and 4 stroke petrol engine • Demonstration using Multimedia 	<ul style="list-style-type: none"> • Activity log
<p>Comparison between Petrol and Diesel engines</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Analyzing skill • Experimental skill • Drawing skills 	<ul style="list-style-type: none"> • Compare petrol and diesel engine 	<ul style="list-style-type: none"> • Comparison Chart of Petrol and Diesel engines • Group discussion • Demonstration using Multimedia 	<ul style="list-style-type: none"> • Activity log

Module 2 : AUTOMOTIVE ENGINES		Unit 2.2 : Engine Construction (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Cylinder block SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Identify and locate the cylinder block Explain the constructional details and function of the cylinder block 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on cylinder block Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log
<p>Cylinder head SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Measuring skill 	<ul style="list-style-type: none"> Identify and locate the cylinder head Explain the constructional details and function of the cylinder head 	<ul style="list-style-type: none"> Actual Demonstration of cylinder head Group discussion Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log
<p>Oil sump SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<ul style="list-style-type: none"> Identify and locate the oil pan Explain the constructional details and function of the Oil pan 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on oil sump Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log
<p>Cylinder liners</p> <ul style="list-style-type: none"> Wet liners Dry liners <p>SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<ul style="list-style-type: none"> Identify, locate and distinguish the cylinder liner Explain the constructional details and function of the cylinder liners 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on wet and dry cylinder liners Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log Discussion

Module 2 : AUTOMOTIVE ENGINES		Unit 2.2 : Engine Constructions (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Gaskets SKILLS <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Identify and locate the different gaskets Explain the constructional details and function of the gaskets 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on different types of gaskets Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log Discussion
Manifolds <ul style="list-style-type: none"> Inlet manifolds Exhaust manifolds SKILLS <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<ul style="list-style-type: none"> Identify and locate the manifolds Describe the constructional details and function of the manifolds 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on inlet and exhaust manifolds Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log
Mufflers SKILLS <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Drawing skill 	<ul style="list-style-type: none"> Identify and locate muffler List different types of mufflers Explain the constructional details and function of the muffler 	<ul style="list-style-type: none"> Actual Demonstration Group discussion on different types of mufflers Demonstration using multimedia 	<ul style="list-style-type: none"> Activity log Questionnaire
Piston assembly <ul style="list-style-type: none"> Piston Piston rings Gudgeon pin SKILLS <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Drawing skill 	<ul style="list-style-type: none"> Identify and locate <ul style="list-style-type: none"> Piston Piston rings Gudgeon pin Explain the constructional details and functions of <ul style="list-style-type: none"> Piston Piston rings Gudgeon pin 	<ul style="list-style-type: none"> Actual Demonstration of piston assembly Group discussion Demonstration using multimedia Seminar 	<ul style="list-style-type: none"> Questionnaire Activity log Seminar report

Module 2 : AUTOMOTIVE ENGINES		Unit 2.2 : Engine Construction (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Piston clearance</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain the need and necessity of piston clearance 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on necessity of piston clearance • Demonstration using multimedia 	
<p>Gudgeon pin connecting methods</p> <ul style="list-style-type: none"> • Full floating • Semi floating • stationery <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill 	<ul style="list-style-type: none"> • Describe different connecting methods of gudgeon pin 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on different connecting methods piston with connecting rods • Demonstration using multimedia • Drawing • Project on gudgeon pin connecting methods 	<ul style="list-style-type: none"> • Activity log • Evaluation of drawing • Project report
<p>Connecting rod</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill 	<ul style="list-style-type: none"> • Identify and locate the connecting rod • Describe the constructional details and function of the connecting rod 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on connecting rod • Demonstration using multimedia 	<ul style="list-style-type: none"> • Questionnaire • Activity log
<p>Crank shaft</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill 	<ul style="list-style-type: none"> • Identify and locate the crankshaft • Explain the constructional details and function of the crankshaft 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on crankshaft • Demonstration using multimedia 	<ul style="list-style-type: none"> • Activity log • Questionnaire

Module 2 : AUTOMOTIVE ENGINES		Unit 2.2 : Engine Construction (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Fly wheel</p> <ul style="list-style-type: none"> • Ring gear <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Cam shafts</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill <p>Timing gears, timing sprockets and chains, timing belts and pulley</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Calculating skill <p>Engine Bearings</p> <ul style="list-style-type: none"> • Main bearings • Thrust bearing <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Identify and locate the flywheel • Explain the constructional details and function of the flywheel <ul style="list-style-type: none"> • Identify and locate the camshafts • Explain the constructional details and function of the camshaft <ul style="list-style-type: none"> • Identify and locate components timing gears, timing sprocket and chain, timing belt and pulley • Explain the constructional details and function of the components <ul style="list-style-type: none"> • Identify and locate the bearings • Describe the constructional details and function of the engine bearings 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion • Demonstration using multimedia • Assignment on flywheels <ul style="list-style-type: none"> • Actual Demonstration • Group discussion on <ul style="list-style-type: none"> • Actual Demonstration • Group discussion on different methods of transferring drive to camshafts from crankshaft • Demonstration using multimedia <ul style="list-style-type: none"> • Actual Demonstration • Group discussion on different engine bearings • Demonstration using multimedia 	<ul style="list-style-type: none"> • Questionnaire • Activity log • Assignment <ul style="list-style-type: none"> • Questionnaire • Activity log <ul style="list-style-type: none"> • Questionnaire • Activity log <ul style="list-style-type: none"> • Activity log • Questionnaire

Module 2 : AUTOMOTIVE ENGINES		Unit 2.2 : Engine Construction (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Valve SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Drawing skill <p>Side valve mechanism</p> <ul style="list-style-type: none"> Full floating Semi floating stationery <p>SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Drawing skill <p>Overhead valve mechanism SKILLS</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Drawing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Identify and locate the engine valves Explain the constructional details and function of the poppet valves Explain the construction and working of side valve mechanism Explain the construction and working of overhead valve mechanism 	<ul style="list-style-type: none"> Actual Demonstration Group discussion engine valves Demonstration using multimedia Actual Demonstration Group discussion on side valve mechanisms Demonstration using Actual Demonstration Group discussion Demonstration using multimedia Seminar on overhead valve mechanisms 	<ul style="list-style-type: none"> Questionnaire Activity log Questionnaire Activity log Questionnaire Activity log Seminar report

Module 2 : AUTOMOTIVE ENGINES		Unit : Engine Construction (74 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Valve clearance</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Measuring skill • Practical skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Define valve clearance • Explain the necessity of valve clearance 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on necessity of valve clearance • Demonstration using multimedia 	<ul style="list-style-type: none"> • Questionnaire • Activity log
<p>Single Over Head Camshaft & Double Over Head Camshaft Mechanisms</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill • Drawing skill 	<ul style="list-style-type: none"> • Describe the constructional details and function of Single Over Head Camshaft • Describe the constructional details and function of double Over Head Camshaft 	<ul style="list-style-type: none"> • Actual Demonstration • Group discussion on SOHC and DOHC • Demonstration using multimedia 	<ul style="list-style-type: none"> • Questionnaire • Activity log
<p>Variable Valve Timing mechanisms</p> <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • State the function and merits of the VVT mechanisms 	<ul style="list-style-type: none"> • Group discussion on VVT • Demonstration using multimedia • Project on VVT 	<ul style="list-style-type: none"> • Asking questions • Activity log • Project report

Module 2 : AUTOMOTIVE ENGINES		Unit 2.3 : Petrol Fuel System (64 Periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Types of fuel system</p> <ul style="list-style-type: none"> • Gravity feed system • Pressure feed system <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • List the types of fuel system <p>Gravity feed system Pressure feed system</p>	<ul style="list-style-type: none"> • Demonstration using Multimedia • Chart • Assignment on properties and grading of different brake fluid 	<ul style="list-style-type: none"> • Collecting Information • Questionnaire • Activity log • Assignment
<p>Layout and working of pressure feed system</p> <ul style="list-style-type: none"> • Air cleaner • Fuel tank • Fuel filter • Fuel pump • Carburetor • Fuel gauge <p>SKILLS</p> <ul style="list-style-type: none"> • Function of Proportionating valve 	<ul style="list-style-type: none"> • Explain the working of pressure feed system. <p>Identify the components and explain its functions</p> <ul style="list-style-type: none"> • Air cleaner • Fuel tank • Fuel filter • Fuel pump • Carburetor • Fuel gauge 	<ul style="list-style-type: none"> • Demonstration with multimedia • Discussion on functions of proportionating valve • Diagram 	<ul style="list-style-type: none"> • Activity log
<p>Construction and working of Air cleaners</p> <ul style="list-style-type: none"> • Dry type air cleaners • Oil bath type air cleaners <p>SKILLS</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • Explain different types of air cleaners and its construction • Explain the working of oil bath type air cleaners 	<ul style="list-style-type: none"> • Demonstration using Multimedia of ABS and EBD • Group discussion on dry type and oil bath type air cleaners • Demonstration using multimedia • Diagram of oil bath type air cleaners 	<ul style="list-style-type: none"> • Questionnaire • Activity log • Activity log • Portfolio (Diagram)

Module 2 : AUTOMOTIVE ENGINES		Unit 2.3 : Petrol Fuel System (64 Periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Types of fuel pumps</p> <ul style="list-style-type: none"> • mechanical • electrical <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Differentiate mechanical and electrical fuel pump and list the merits and demerits of it 	<ul style="list-style-type: none"> • Group discussion on mechanical and electrical type fuel pump <p>Demonstration Videos Working models</p>	<ul style="list-style-type: none"> • Activity log
<p>Construction and working of electrical fuel pump</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • Explain the construction and working of electrical fuel pump 	<ul style="list-style-type: none"> • Demonstration using Multimedia <p>Actual Demo of electrical fuel pump</p>	<ul style="list-style-type: none"> • Activity log
<p>Fuel filters</p> <ul style="list-style-type: none"> • cartridge type fuel filters <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • Explain the working of cartridge type Fuel Filter 	<ul style="list-style-type: none"> • Demonstration using Multimedia 	<ul style="list-style-type: none"> • Activity log
<p>Working of simple carburetor</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • Explain the working of Simple Carburetor 	<ul style="list-style-type: none"> • Demonstration using Multimedia <ul style="list-style-type: none"> • Actual demo 	<ul style="list-style-type: none"> • Activity log.

Module 2 : AUTOMOTIVE ENGINES		Unit 2.3 : Petrol Fuel System (64 Periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Air fuel ratio</p> <ul style="list-style-type: none"> rich mixture lean mixture stoichiometric <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Measuring skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Describes various mixture strengths used in Petrol Engines and states its necessity 	<ul style="list-style-type: none"> Group discussion on air fuel ratio Graphical Demo 	<ul style="list-style-type: none"> Activity log
<p>Layout and working of Multi Point Fuel Injection system (MPFI)</p> <ul style="list-style-type: none"> Function of ECU Name and functions of Sensors <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<ul style="list-style-type: none"> Explain working and layout of MPFI system Discuss the name and functions of ECU and different sensors used in MPFI system 	<ul style="list-style-type: none"> Demonstration using Multimedia 	<ul style="list-style-type: none"> Activity log

Module 2 : AUTOMOTIVE ENGINES		Unit 2.4 : Diesel Fuel system		(49 periods)
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment	
<p>Layout and working of Individual pump system</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>working of Distributor type injection pump</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>Working of Common rail direct injection system (CRDI)</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>Components of diesel fuel system</p> <ul style="list-style-type: none"> Injectors Nozzles diesel fuel filters <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> Explain the working of individual pump diesel fuel system Explain working of distributor type fuel pump Explain working of CRDI and list its advantages Describe the functions of various Components of diesel fuel system <ul style="list-style-type: none"> Injectors Nozzles diesel fuel filters 	<ul style="list-style-type: none"> Demonstration using Multimedia Layout Diagram of individual pump system Demonstration using Multimedia Seminar on distributor type injection pump Demonstration using Multimedia Project on CRDI Group discussion on injectors, nozzles and diesel fuel filters Demonstration Actual Demo 	<ul style="list-style-type: none"> Activity log Portfolio (Diagram) Activity log Seminar report Activity log Project report Activity log 	

Module 2 : AUTOMOTIVE ENGINES		Unit 2.4 : Diesel Fuel system		(49 periods)
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment	
<p>Governors (concept only)</p> <ul style="list-style-type: none"> • Mechanical • Pneumatic • Electronic <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Glow plugs and De-compressors</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Alternate fuel vehicles</p> <ul style="list-style-type: none"> • LPG • CNG • Electric • Hybrid cars <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Turbocharger Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Identify different types of Governors and state its necessity in Diesel fuel system • Explain the functions of Glow plugs and De-compressors • Explain the concept and identify the necessity of Alternate fuel vehicles • Explain the layout and working of turbocharger 	<ul style="list-style-type: none"> • Demonstration of Governors Videos • Demonstration of glow plugs and de compressors • Group discussion on alternate fuel vehicles Demonstration Videos Project Work on alternate fuel vehicles • Field Visit Demonstration using multimedia 	<ul style="list-style-type: none"> • Activity log • Activity log • Activity log • Project Evaluation • Activity log 	

Module 2 : AUTOMOTIVE ENGINES		Unit 2.5 : Cooling System		(44 periods)
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment	
<p>Necessity and methods of Cooling system</p> <ul style="list-style-type: none"> • Air Cooling • Liquid Cooling <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Functions of cooling system</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Working of Air cooling system</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Working of Pump circulation system</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Explain necessity and different methods of Cooling system in engines • Describe various functions of cooling system • Explain the working of air cooling system • Explain working of Pump circulation system and compare it with other cooling systems used in automotive engines 	<ul style="list-style-type: none"> • Group discussion on necessity and methods of cooling system • Demonstration • Videos • Group discussion on functions of cooling system • Demonstration • Videos of air cooling system • Demonstration • Videos on working of pump circulation system • Diagram 	<ul style="list-style-type: none"> • Activity log • Activity log • Activity log • Activity log • Activity log • Activity log • Portfolio (Diagram) 	

Module 2 : AUTOMOTIVE ENGINES		Unit 2.5 Cooling System		(44 periods)
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment	
<p>Cooling system components-construction working and function of</p> <ul style="list-style-type: none"> • Radiator • water pump • Thermostat valve • Pressure cap • Expansion reservoir • Cooling fan <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<p><i>The learner will be able to:</i></p> <ul style="list-style-type: none"> • Describe the construction working and functions of cooling system components <ul style="list-style-type: none"> - Radiator - water pump - Thermostat valve - Pressure cap - Expansion reservoir - Cooling fan 	<ul style="list-style-type: none"> • Group discussion on cooling system components Demonstration Videos Actual Demo 	<ul style="list-style-type: none"> • Activity log 	
<p>Troubles and remedies of cooling system</p> <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill <p>Coolants</p> <ul style="list-style-type: none"> • Additives • Anti-Freeze solution <p>Skills</p> <ul style="list-style-type: none"> • Identifying skill • Observing skill • Analyzing skill 	<ul style="list-style-type: none"> • List Troubles and remedies of cooling system • Explain the properties and advantages of coolant over water 	<ul style="list-style-type: none"> • Group discussion • Chart Preparation on trouble and remedies of cooling system • Group discussion on coolants 	<ul style="list-style-type: none"> • Activity log • Activity log 	

Module 2		Unit : 2.6 LUBRICATION SYSTEM		(53 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment		
<p>Necessity and functions of Lubrication system</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>Grading of Lubricants</p> <ul style="list-style-type: none"> SAE grade <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>Types of lubricating system</p> <ul style="list-style-type: none"> Petrol system Splash system pressure system Dry Sump System <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill Classification skill <p>Working of pressure feed lubrication system</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<p><i>The learner is able to:</i></p> <ul style="list-style-type: none"> Explain the necessity and functions of Lubrication system Explain SAE grade in grading of Lubricants List different types of lubricating System and Compare various lubrication systems Explain the working of pressure feed lubrication system 	<ul style="list-style-type: none"> Group discussion on necessity and functions of lubrication system Group discussion on grading of lubricants Assignment on lubricants based on SAE grade Demonstration Group discussion on different types of lubrication system Demonstration Videos showing the working of pressure feed lubrication system Diagram 	<ul style="list-style-type: none"> Activity log Activity log Activity log Activity log Activity log Activity log Portfolio (Diagram) 		

Module 2		Unit : 2.6 LUBRICATION SYSTEM		(53 periods)
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment	
<p>Components of Lubrication system</p> <ul style="list-style-type: none"> Oil strainer Oil pump Oil filter Oil gallery <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<p><i>The learner is able to:</i></p> <ul style="list-style-type: none"> Identify the components and functions of various component in lubrication system 	<ul style="list-style-type: none"> Demonstration of components of lubrication system Videos 	<ul style="list-style-type: none"> Activity log 	
<p>Construction and working of Rotor type oil pump</p> <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill <p>Oil filtering methods</p> <ul style="list-style-type: none"> Full flow system Bypass flow system <p>Skills</p> <ul style="list-style-type: none"> Identifying skill Observing skill Analyzing skill 	<ul style="list-style-type: none"> Explain construction and working of Rotor type oil pump. Explains working of the different oil filtering methods and compare the full flow and bypass flow system 	<ul style="list-style-type: none"> Demonstration of rotor type oil pump Videos Group discussion on oil filtering methods Demonstration Videos 	<ul style="list-style-type: none"> Activity log Activity log 	

PRACTICAL ACTIVITIES OF MODULE-2

Unit -1 Engine Fundamentals

1. Measurement of cylinder bore using internal micrometer
2. Measurement of stroke using depth gauge
3. Calculate the swept volume of the cylinder
4. Find the compression ratio using compression gauge
5. Chart preparation of difference between Petrol and Diesel engines
6. Chart preparation of difference between 2 stroke and 4 stroke petrol engine

Unit -2 Engine Construction

1. Familiarization of engine parts
 - Cylinder block
 - Piston
 - Crank shaft
 - Connecting rod
 - Valves
 - Camshaft
2. Decarbonizing of cylinder head
3. Measuring ovality
4. Measuring taper
5. Replacement of Piston and Piston rings
6. Inspection of crankshaft , setting of main bearing and measurement of internal clearance using internal micrometer
7. Valve lapping
8. Valve clearance adjustment
9. Valve timing setting
10. General overhauling of petrol engine
11. General overhauling of Diesel engine
12. Care and maintenance of engine
13. Trouble shooting of engine

Unit 3 - Petrol Fuel System

1. Servicing of petrol fuel system
2. Servicing of Carburetor.

3. Servicing of gear type fuel pump
4. Servicing of rotor type fuel pump.
5. Study of Electrical type fuel pump
6. Servicing of oil bath type air cleaner
7. Study of cartridge type air cleaner
8. Study of petrol filter
9. Chart preparation of fuel system circuit component
10. Care and maintenance of petrol fuel system
11. Trouble shooting of petrol fuel system

Unit - 4 Diesel Fuel system

1. Servicing of Diesel fuel system
2. Servicing of fuel injection pump
3. Servicing of fuel filter
4. Preparation of trouble shooting chart
5. Servicing of Diesel injector
6. Testing of injector
7. Care and maintenance of diesel fuel system
8. Trouble shooting of diesel fuel system

Unit -5 Cooling System

1. Study of cooling fins
2. Servicing of radiator
3. Servicing of water pump
4. Servicing of thermostat
5. Maintenance of hose, water jackets for leakage
6. Coolant preparation and refilling
7. Preparation of chart "causes of engine overheating"
8. Chart Preparation of cooling system troubleshooting
9. Care and maintenance of cooling system.
10. Trouble shooting of cooling system

Unit -6 Lubrication System

1. Servicing of oil pump
2. Servicing of oil filter

3. Oil changing practice
4. General checkup of lubrication system
5. Greasing
6. Chart preparation of various lubricants based on grades
7. Care and maintenance of Lubrication System
8. Trouble shooting of lubrication system

MODEL QUESTION PAPERS OF MODULE 2

2.1 Engine Fundamentals

1. Define the following
 - a) TDC
 - b) Stroke
 - c) Compression ratio
 - d) Bore
2. When you observe an engine of a car you could see spark plugs on it.
 - a) Name the type of that engine
 - b) Explain its working.

2.2 Engine Constructions

1. When the engine gets heated, in some cases the piston may expand more than that of the cylinder. This problem may cause piston seizure. How this problem is solved in a cylinder?
2. A component is attached to the rear end of crankshaft for sudden speed up and sudden slowdown of crankshaft rotation.
 - a) Identify the component
 - b) Write other two functions of this components.

2.3 Petrol Fuel System

1.
 - a) Elaborate MPFI
 - b) Draw the layout of MPFI system used in a car and explain its working
2. A seminar was conducted based on the topic - working of electrical fuel pump. Prepare its seminar report.

2.4 Diesel Fuel System

1. In diesel car, the engine can be stopped by turn off the engine key. What is happening while doing so?
2. The modern diesel engine works in CRDI.
 - a) What do you mean by CRDI ?

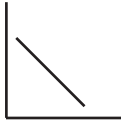
- b) Explain its working

2.5 Cooling System

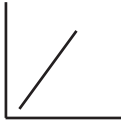
1. "Cool engine as much as possible".
 - a) Do you agree with this statement?
 - b) State the reason.
2. The radiator has an upper tank and a lower tank. Which tank contains water with low temperature? Why?

2.6 Lubrication System

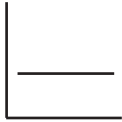
1.




(a)



(b)



(c)



(d)

- a) Which graph shows the correct relation between viscosity and temperature?
 - b) State reason for your selection
2. We are storing lubricating oil in the oil sump. Through a layout explain how the oil reach to different parts of the engine?

OVERVIEW

This unit deals with the basic concept and definitions of automobile. Students from different schools, most of them will not have any technical background. In their perception it is a new subject. So a basic concept of automobile engineering has to give. Moreover to create and to improve the aptitude to study the subject, more motivational strategies has to impart on them. This unit fulfills all these basic needs.

DETAILED UNIT ANALYSIS OF UNIT 1

Module 1 : AUTOMOTIVE CHASSIS			
Unit : Introduction to Automobile (20 periods)			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
Definition of Automobile	<i>The learner will be able to:</i>		
<ul style="list-style-type: none"> Explain the concept of Automobile 	<ul style="list-style-type: none"> Explain the concept of Automobile 	<ul style="list-style-type: none"> Visual Media Slide show 	<ul style="list-style-type: none"> Identification list Questionnaire
History of Automobile <ul style="list-style-type: none"> Observing Analysing 	<ul style="list-style-type: none"> Explain basic idea of evolution of Automobile and try to investigate more ideas about it. 	<ul style="list-style-type: none"> Chart Collecting Information and presentation(group work) 	<ul style="list-style-type: none"> Chart showing evolution of automobile Questionnaire Quiz Assignment(CE)
Classification of Automobile <ul style="list-style-type: none"> Purpose Capacity Fuel used Number of wheels Drive of vehicle 	Categorize the vehicles based on Classification of Automobile <ul style="list-style-type: none"> Purpose Capacity Fuel used Number of wheels Drive of vehicle 	<ul style="list-style-type: none"> Survey (group work)of vehicles Visual Media 	<ul style="list-style-type: none"> Debate Chart Questionnaire
SKILLS <ul style="list-style-type: none"> Observation skill Comparison skill Analytical skill 			
Technical Specification of Vehicle SKILLS <ul style="list-style-type: none"> Observation skill Comparison skill Analytical skill Skill of charting 	<ul style="list-style-type: none"> Using the manual, Explain the Technical Specification of Vehicle 	<ul style="list-style-type: none"> Chart showing vehicle specification Manual Collection of technical specification from manual(group work) 	<ul style="list-style-type: none"> Quiz Questionnaire Product evaluation

Content : Definition of Automobile
Suggested activities : slide show

Show slides of different pictures which include cars, bikes, auto rickshaw, buses, Lorries, trailer, ship, aero planes, bullock cart, horse carrier, tractor etc. Then ask students to list out automobile from it. Students observe the figures and categorize it. Teacher evaluates the list and concludes that “Automobile is self-propelled vehicle which moves on the ground or road”.

Discussion points

- Self- propelled
- Purpose of automobile
- Train is moving on a definite path
- Marine engineering
- Aeronautical engineering
- Locomotive engineering

Practical Work : Nil

Assessment

- Category wise list of vehicles
- Activity log

CE Element : Category wise list of vehicle prepared by students

Content: History of Automobile

Suggested activities: chart

Teacher shows a flow chart of evolution of automobiles. It starts from the discovery of wheels, every major evolution points to the modern automobile vehicle. Students get an overall idea of historical evolution of automobile.

Discussion points

- Discovery of wheel
- Horse carrier
- Self-propelled vehicle
- Father of automobile
- Major inventors of automobile

Practical Work : Nil

Assessment : Activity log

CE Element : Nil

Content : Classification of automobile

Suggested activities : Survey

Teacher make students into 5 groups and take them to road side. Ask

them to collect names of different vehicles which is passing in a stipulated time and categorize it according to different manners. Then the group leaders present the data in the class. The teacher conclude the topic by arranging the vehicle in different categories.

Discussion points

- According to purpose
- According to capacity
- According to number of wheels
- According to fuel used
- According to drive of the vehicle

Practical Work : Survey**Assessment**

- Survey report
- Activity log

CE Element : Survey report**Content : Technical specification of vehicle**

Suggested activities : Collection of brochures or specification chart of different vehicles

Students are arranged into 2 or 3 members group. Ask them to collect brochures or specification details from the owner's manual of the vehicle. Teacher narrate the definition of important specification of vehicle.

Discussion points

- Overall length
- Overall width
- Overall height
- Ground clearance
- Wheel base
- Wheel track
- Kerb weight
- Turning radius
- Engine power
- Engine torque
- Engine capacity

Practical Work : data collection**Assessment**

- Evaluation of specification chart
- Activity log

CE Element : Nil

LIST OF TOOLS, EQUIPMENTS & MATERIALS

Sl. No.	Description	No. of unit
I	MEASURING TOOL	
1	Steel Rule	6
2	Inside Caliper	6
3	Steel rule	6
4	Outside Caliper	6
5	Try Square	6
6	Vernier Caliper	6
7	External Micrometer	6
8	Internal Micrometer	6
9	Combination Set	6
II	MEASURING EQUIPMENTS	
1	Multimeter	4
2	Hydrometer	4
3	Cell Tester	4
4	Compression Tester	2
5	Tachometer	2
III	MARKING TOOL	
1	Scriber	6
2	Divider	6
3	Center Punch	6
4	Surface Gauge	6
5	Surface Plate	1
6	V Block	2
7	U Clamp	4
IV	CUTTING TOOL	
1	Hack Saw Frame - 300mm	2
2	Hack Saw Blade - 300mm	12
3	Chisels	6
4	Half Round File	6
5	Flat File (12 Inch)	6
6	Flat smooth files -single cut(10 Inch)	6
7	Round File (8 Inch)	6
8	Triangular File (8 Inch)	6
9	Square File (8 Inch)	6
10	Scraper	6
11	Electric Drilling Machines	3
12	Twist drill -drill bit set (6mm to 12mm)	3
13	Reamer set	3
14	Tap	3
15	Die set (1/4",1/2",3/4", 1")	3

V	HAND TOOLS	
1	Hammer	6
2	Hard Face Hammer (500g)	6
3	Soft Face Hammer (500g)	6
4	Ball Peen Hammer (500g)	6
5	Straight Peen Hammer (500g)	6
6	Cross Peen Hammer (500g)	6
7	Open End Spanner Set - Standard	4
8	Ring Spanner Set - Standard	4
9	Adjustable Spanner	6
10	Vice Grip Spanner	6
11	Pipe Wrench	6
12	Socket Spanner Set - 10mm to 25mm Standard	3
13	Combination Plier	6
14	Nose Plier	6
15	Flat screw driver	6
16	Star screw driver	6
15	Side Cut Plier	6
16	Stripper	6
17	Bench Vice	12
18	Pipe Vice	6
19	Anvil	4
VI	SPECIAL TOOLS	
1	Pneumatic Tools	6
2	Torque Wrench	4
3	Spark Plug Spanner	6
4	Wheel Spanner	6
5	Allen Key Set-Standard	4
6	Stud Extractor	6
7	Circlip Plier	6
8	Piston Ring Remover	6
9	Valve Spring Compressor	6
VII	EQUIPMENTS	
1	Bearing Puller	2
2	Screw Jack	2
3	Scissor Jack	2
4	Hydraulic Jack	2
5	Axle Stand	6
6	Chain and puller	3
7	Air Compressor	1
8	Battery - 12V	2
9	Spark Plug Tester	2
10	Injector Nozzle Tester	2

VIII	GAUGES	
1	Feeler Gauge set-Standard	2
2	Thread Pitch Gauge	2
3	Compression Gauge	2
4	Bore Gauge	2
5	Dial Gauge	2
6	Standard Wire Gauge	2
IX	MACHINE TOOLS	
1	Drilling Machine	1
2	Grinding Machine	1
3	Lapping Machine	1
X	MATERIALS REQUIRED	
1	Cotton Waste (5kg)	1
2	Emery Paper	10
3	Grease (1kg)	1
4	Lubricating Oil (2litre)	1
5	Coolant (2litre)	1
6	Kerosene (3litre)	1
7	Petrol (3litre)	1
8	Diesel (3litre)	1
9	Wire Brush	6
10	Sheet Metal Tray	1
11	Lapping Compound (200g)	1
12	Diluted H ₂ SO ₄ (500ml)	1
13	Petroleum Jelly (500ml)	1
14	Filter Element	4
15	Clutch Plate	4
16	Gasket Kit	3
17	Oil Seal	3
18	Chalk (1 box)	3
XI	AUTOMOBILE EQUIPMENTS	
1	Four Stroke Four Cylinder Petrol Engine	2
2	Four Stroke Four Cylinder Diesel Engine	2
3	Two Stroke Petrol Engine	1
4	Distributor Type Diesel Fuel Injection Pump	2
5	Diesel Injectors	6
6	Spark Plug	6
7	S U Electrical Fuel Pump	3
8	A C Mechanical Fuel Pump	3
9	Oil Bath Type Air Cleaner	3
10	Catridge Type Air Cleaner	3
11	Thermostat Valve	4

12	Radiator	1
13	Water Pump (Centrifugal)	2
14	Oil Pump - Rotary type	2
15	Oil Filter	2
16	Back Plate Assembly - Drum Brake	2
17	Back Plate Assembly - Disc Brake	2
18	Tandem Master Cylinder	4
19	Wheel Cylinder	4
20	Brake Valve	2
21	Tyre and wheel Assly.	4
22	Steering Gearbox-Rack & Pinion	2
23	Steering Gearbox-Recirculating Ball Type	1
24	Leaf Spring Assly.	2
25	Coil Spring	2
26	Shock Absorber- Telescopic	4
27	Automatic Tyre Changer	1
28	Puncturing units	1
29	Air compressor	1
30	Hose	1
31	Nozzle	1
32	Tyre lever	1

List of Reference Books and Instructional Materials

1. THE AUTOMOTIVE ENGINES - *S Srinivasn - Tata Mc Graw-Hill - 2001*
2. A TEXT BOOK OF AUTOMOBILE ENGINEERING - *R K Rajput - Lakshmi Publications (P) Ltd - 2007*
3. THE AUTOMOBILE-Herban Singh Reyat-*S.Chand and Co.- 2004*
4. AUTOMOBILE ENGINEERING Vol. I- *Dr. Kirpal singh -Standard Publishers Distributers -2003*
5. AUTOMOBILE ENGINEERING Vol. II -*Dr. Kirpal singh -Standard Publishers Distributers - 2003*
6. AUTOMOTIVE MECHANICS - *William H Cruise & Donald L Anglin - Tata McGraw-Hill - 2007*
7. AUTOMOBILE ENGINEERING - *Narag - Khanna Pub.- 1986*
8. AUTOMOBILE ENGINEERING - *R B Guptha- Sathyaprakasan Pub. -2006*