

3.1 PRINCIPLES OF THERMAL ENGINEERING

L T P
3 - 3

RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the I.C engines, air compressors and air conditioning of automobiles. Therefore, it is essential to teach concepts, principles, applications and practices covering laws of thermodynamics, basic air cycles, types of fuel used and their properties and components of air conditioners. Hence this subject has been included in this course.

DETAILED CONTENTS

1. Thermodynamic terminology (06 hrs)
Concept of thermodynamics, heat, temperature, intensive and extensive properties, path, process, system, surroundings, enthalpy, internal energy and thermodynamic work.
2. Gas Laws (06hrs)
Boyle's law, Charle's law, Joule's law, Characteristic gas equation, gas constant, universal gas constant. Simple numerical problems based on above laws.
3. Laws of Thermodynamics (08 hrs)
Zeroth law of thermodynamics, Irreversible process, First law of thermodynamics, Second law of thermodynamics (concept only), Thermal efficiency, Heat pump, heat engine and heat sink, concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic, throttling and free expansion processes. Numericals based on above processes.
4. Air Cycles (08 hrs)
Carnot cycle – concept only, Otto cycle, Diesel cycle, Dual combustion cycle , Numericals based on above cycles.
5. Air Compressors (06 hrs)
Reciprocating air compressor, Centrifugal compressor, Rotary air compressor - its types. Working of single stage and double stage compressor and applications, Super charging

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| 6 | Heat Transfer | (06 hrs) |
| | Modes of heat transfer – Conduction, convection, radiation, Fourier’s Law, Numericals based on Fourier’s Law. | |
| 7. | Refrigeration and Air Conditioning | (08 hrs) |
| | Concept of refrigeration, Unit of refrigeration, refrigerants, heat pump, coefficient of performance, rating of refrigeration machines | |
| | Principles of air conditioning, Concept of human comfort, Air-conditioning system, components of air conditioning system and their function | |

LIST OF PRACTICALS

1. To find flash point and fire point of a given fuel.
2. To find viscosity of given fuel
3. To conduct Morse test
4. To prepare heat balance sheet of an I.C. Engine
5. Identification of components in air-conditioning system
6. To find specific fuel consumption
7. To find viscosity index of lubricant by Orsat apparatus
8. Study of components of a refrigerator

INSTRUCTIONAL STRATEGY

Teachers should provide simple exercises to students involving applications of various concepts and principles being covered in the subject. Problems on various topics should be prepared and students should be asked to solve them. In practical work, students should independently perform practicals.

LIST OF BOOKS

1. Thermal Engineering by SK Kulshreshtha; Vikas Publishing House Pvt. Ltd., Delhi
2. Thermal Engineering by A.S. Sarao; Satya Prakashan, New Delhi
3. Engineering Thermodynamics by Valan A. Arasu, TMH, Delhi
4. Thermal Engineering by P.L. Ballaney; Khanna Publishers, Delhi
5. Thermal Engineering by R.K. Rajput; Laxmi Publications, New Delhi
6. Refrigeration and Air conditioning by G.S. Aulakh, Eagle Prakashan, Jalandhar.
7. Thermodynamics –I by Er. B.S. Ubhi, S.K. Kataria & Sons, Delhi.
8. Hydraulics & Pneumatics by Birinder Singh, Kaption Publishing house, New Delhi.
9. Hydraulic and Pneumatic control by Shammuga Sundram, S.Chand&Company Ltd., New Delhi.
10. Pneumatic controls by Festo Didactic, Bangalore

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	06	12
2	06	12
3	08	18
4	08	18
5	06	12
6	06	12
7	08	16
Total	48	100

3.2 APPLIED MECHANICS

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3 - 2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS

1. Introduction (04hrs)
 - 1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.
 - 1.2 Definition, basic quantities and derived quantities of basic units and derived units
 - 1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration
 - 1.4 Concept of rigid body, scalar and vector quantities
2. Laws of forces (09 hrs)
 - 2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force
 - 2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position
 - 2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components
 - 2.4 Free body diagram
 - 2.5 Equilibrant force and its determination
 - 2.6 Lami's theorem (concept only)
[Simple problems on above topics]

3. Moment (09 hrs)
- 3.1 Concept of moment
 - 3.2 Moment of a force and units of moment
 - 3.3 Varignon's theorem (definition only)
 - 3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)
 - 3.5 Parallel forces (like and unlike parallel force), calculating their resultant
 - 3.6 Concept of couple, its properties and effects
 - 3.7 General conditions of equilibrium of bodies under coplanar forces
 - 3.8 Position of resultant force by moment
[Simple problems on the above topics]
4. Friction (06 hrs)
- 4.1 Definition and concept of friction, types of friction, force of friction
 - 4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
 - 4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.
5. Centre of Gravity (08 hrs)
- 5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies
 - 5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion
 - 5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed
[Simple problems on the above topics]

6. Simple Machines (06 hrs)
- 6.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines
 - 6.2 Simple and compound machine (Examples)
 - 6.3 Definition of ideal machine, reversible and self locking machine
 - 6.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
 - 6.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
 - 6.6 Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application [Simple problems on the above topics]
7. Torsion (06 hrs)
- 7.1 Torsion in shafts/bars
 - 7.2 Modulus of rigidity
 - 7.3 Torsional Equation (simple numerical problems)
 - 7.4 Power Transmission in shafts (simple numerical problems)

LIST OF PRACTICALS

1. Verification of the polygon law of forces using greaves and apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
2. Applied Mechanics By, Col. Harbhajan Singh, TL Singha and Parmod Kumar Singla, Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
3. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
4. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
5. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	08
2	09	20
3	09	20
4	06	12
5	08	16
6	06	12
7	06	12
Total	48	100

3.3 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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4 - 2

RATIONALE

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical and electronics engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

DETAILED CONTENTS

1. Application and Advantage of Electricity (06 hrs)
Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy
2. Basic Electrical Quantities (06 hrs)
Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit
3. Electromagnetic Induction (06 hrs)
Production of e.m.f., idea of a transformer and its working principle
4. Transmission and Distribution System (10 hrs)
Key diagram of 3 phase transmission and distribution system, Brief functions of accessories of transmission line. Difference between high and low voltage distribution system, identification of three-phase wires, neutral wire and earth wire in a low voltage distribution system. Identification of voltages between phases and between one phase and neutral. Difference between three-phase and single-phase supply. Arrangement of supply system from pole to the distribution board, function of service line, energy meter, main switch, distribution board

5. Domestic Installation (10 hrs)
- Distinction between light-fan circuit and single phase power circuit, sub-circuits, various accessories and parts of domestic electrical installation. Identification of wiring systems.
6. Electric Motors and Pumps (12 hrs)
- Definition and various applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor. Conversion of horse power in watts or kilowatts, Type of pumps and their applications, Use of direct online starter and star delta starter
7. Electrical Safety (06hrs)
- Electrical shock and precautions against shock, treatment of electric shock, concept of fuses and their classification, selection and application, concept of earthing and various types of earthing, applications of MCBs and ELCBs
8. Basic Electronics (08hrs)
- Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, symbols, identification of terminals of transistor, of current flowing in a transistor their characteristics and uses. Characteristics and applications of a thyristor, characteristics and applications of servo motors.

LIST OF PRACTICALS

1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation
2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation
3. To test a battery for its charged and discharged condition.
4. Identify the different faults in a domestic wiring system
5. Connection and reading of an electric energy meter with supply and load using ammeter, voltmeter, wattmeter
6. Study of a distribution board for domestic installation
7. Ohm's law verification
8. Verification of law of resistance in series
9. Verification of law of resistance in parallel
10. Draw V-I characteristics of P-N junction diode
11. Draw input and output characters of a transistor
12. Draw reverse break down characteristics of a zener diode

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

RECOMMENDED BOOKS

1. Basic Electrical Engineering by PS Dhogal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	10
2	6	10
3	6	10
4	10	15
5	10	15
6	12	18
7	6	10
8	8	12
Total	64	100

3.4 BASIC WORKSHOP

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RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is required to be imparted. Hence the subject of basic workshop is being included in the curriculum.

DETAILED CONTENTS

1. LATHE (10 hrs)
 - 1.1 Concept of cutting tools and Cutting materials
 - 1.2. Principles of Turning
 - 1.3 Description and function of various parts of lathe
 - 1.4 Classification of various types of lathe
 - 1.5. Drives and transmission
 - 1.6 Work holding devices
 - 1.7 Lathe operations
 - 1.8 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time
 - 1.9 Lathe accessories: centre dogs , different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment etc.
 - 1.10 Brief description of capstan and Turret lathe, their comparison, work holding and tool grinding devices in capstan and Turret lathe

2. DRILLING (07 hrs)
 - 2.1. Principles of drilling
 - 2.2. Classification of drilling machines and their description
 - 2.3 Various operation performed on drilling machines
 - 2.4. Speeds and feeds during drilling, impact of these parameters on drilling, machining time.
 - 2.5 Types of drills and their features; nomenclature of a drill
 - 2.6. Drill holding devices
 - 2.7 Types of reamers

- 3. BORING (05 hrs)
 - 3.1 Principles of Boring
 - 3.2 Classification of Boring machines
 - 3.3 Specifications of boring machine
 - 3.4 Boring tools, boring bars and boring heads
 - 3.5 Description of Jig boring machine

- 4 SHAPING, PLANING AND SLOTTING (10 hrs)
 - 4.1. Working Principles of shaper, planer and slotter
 - 4.2. Types of shapers
 - 4.3. Types of planers
 - 4.4 Quick Return mechanism
 - 4.5 Work holding devices used in shaper, planer and slotter
 - 4.6 Specifications of Shaper, Planer and slotter
 - 4.7 Speeds and feeds in above processes

- 5 JIGS AND FIXTURES (07 hrs)
 - 5.1. Importance and use of jigs and fixtures
 - 5.2. Principle of location
 - 5.3. Locating devices
 - 5.4. Clamping devices
 - 5.5 Types of jigs
 - 5.6 Fixtures for milling, turning, welding and grinding
 - 5.7 Advantages of jigs and fixtures

- 6 BROACHING (05 hrs)
 - 6.1. Introduction
 - 6.2. Types of Broaching machines
 - 6.3. Elements of broach tool, broach tool details, nomenclature, types and tool material.

- 7. CUTTING FLUIDS AND LUBRICANTS (05 hrs)
 - 7.1. Function of Cutting fluids
 - 7.2. Types of cutting fluids
 - 7.3. Difference between cutting fluids and lubricants

- 7.4. Selection of cutting fluids for different materials and operations
- 7.5. Common methods of lubrication of machine tools.

8 WELDING PROCESSES (15 hrs)

- 8.1. Principles of Weldings, Classification of Welding processes; advantages and limitations of welding; Industrial applications of welding; Welding positions and techniques, symbols.
- 8.2. Gas Welding – Principle of operation, types of gas welding flames and their applications; gas welding equipment – Gas welding torch; oxy-acetylene cutting torch, blow pipe, pressure regulators, filler rods and fluxes
- 8.3. Arc Welding – Principle of operation, Arc welding, machine and equipment; A.C & D.C. arc welding. Effect of polarity, current regulation and voltage regulation, Electrodes- classification; B.I.S specification and selection; flux for Arc welding
- 8.4. Other Welding Processes:- Resistance welding – principles , advantages and its limitations. Working and application of spot welding; seam welding, projection welding and percussion welding.

Atomic hydrogen welding; shielded metal arc welding; submerged arc welding, welding defects. Methods of controlling welding defects and inspection of welded joints.
- 8.5. Modern Welding Methods:- Method, Principle of operation, advantages, disadvantages and application of tungsten inert gas (TIG) welding, metal inert gas (MIG) welding, thermit, welding, electroslag welding, electron beam welding, ultrasonic welding, laser beam welding, robotic welding

LIST OF PRACTICALS

- Job 1 - Prepare Gas Welding joint in vertical position joining M.S. plate
- Job 2 - Exercise on gas cutting of mild steel plate with oxy-acetylene gas torch.
- Job 3 - Exercise on preparation of T-joint by arc welding
- Job 4 - Exercise on spot welding/seam welding
- Job 5 - Exercise on MIG and TIG welding
- Job 6 - Exercise of simple turning and step-turning
- Job 7 - A composite job involving turning, taper turning, external thread cutting and Knurling
- Job 8 - Prepare a V-block up to ± 0.5 mm accuracy on shaper machine
- Job 9 - Exercise on key way cutting and spline cutting on shaper machine.

INSTRUCTIONAL STRATEGY:

Teachers should lay emphasis in making students conversant with concepts and principles of various machines in machine shop. Focus should be on preparing jobs using various machines in the workshop.

RECOMMENDED BOOKS

1. Workshop Technology by B.S. Raghuvanshi, Danpat Rai & Sons, New Delhi
2. Manufacturing Technology by M.Adithan and Shri AB Gupta-New Age International (P) Ltd. New Delhi
3. Elements of Workshop Technology by S.K. Chaudhary & Hajra: Asia Publishing House.
4. A Text book of Production Engineering by P.C. Sharma, S. Chand and Company Ltd. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	20
2	07	10
3	05	05
4	10	20
5	07	10
6	05	05
7	05	05
8	15	25
Total	64	100

3.5 AUTO ENGINE - I

RATIONALE

Engine forms the heart of an automobile. As the scope of auto engines is very wide, it has been divided into two subjects, Auto Engine –I and Auto Engine-II. This subject deals with engine terminology basic concept of 2 stroke and 4 stroke engine, classification of engines, constructional details of petrol engine, fuel system, cooling system, lubrication system and ignition system,.

DETAILED CONTENTS

1. Introduction (09 hrs)
 - Engine as a power source
 - Concept of internal combustion engine.
 - Engine dimensions : Bore, stroke, dead centres, compression ratio, swept volume, clearance volume, engine capacity, engine torque engine power at the crank shaft.
 - Classification of engines as per stroke, cycle, fuel, ignition, number and arrangement of cylinders, reciprocating and rotary engines.
 - Concept of 2 stroke and 4 stroke engines and their comparison.
 - Working principles of petrol and diesel engines.

2. Constructional details (09 hrs)
 - Constructional details of cylinder block, cylinder head, cylinder liner piston, piston rings, gudgeon pin, connecting rod, crankshaft, camshaft, valve mechanisms, flywheel and damper.

3. Fuel System (08 hrs.)
 - 3.1. Fuel system in spark ignition engine: Fuel feed system, fuel pumps-its types, fuel tank, fuel lines, fuel filters, concept of carburetion. Working and construction of a simple carburetor. Advantages of using fuel injection system in spark ignition engines. Concept of MPFI system, Constructional details of an MPFI system. Dry and wet air cleaners.

 - 3.2 Fuel systems in compression ignition engines: Fuel feed system , fuel filters- its types, priming and fuel feed pump. Fuel injection pump-plunger and barrel type, distributor type. Fuel injectors. Concept of governing, Working principle of a governor. Concept of supercharging, Types of superchargers, Turbochargers

4. Ignition System in S.I. Engine and Combustion in C.I. Engine (10 hrs)

4.1. Ignition system in S.I. engines.

Concept of ignition system, battery and magneto types of ignition systems .
Function of ignition coil, condenser, contact breaker point, distributors, spark
plugs. Distribution less ignition system.

4.2. Combustion in C.I. Engines:

Combustion phenomenon, phases of combustion, squish and swirl, types of
combustion chambers for C.I. engines

5 Cooling System (09 hrs)

Necessity of cooling system. Air cooling, Water cooling system. Components of
water cooling system- Radiators, thermostat, water pump, fan, pressure cap,
water jackets, antifreeze solution. Trouble shooting.

6 Lubrication System (09 hrs)

Necessity of lubrication system, pressure lubrication system. Splash
lubrication. Components of lubrication system-oil pump, oil lines, oil filters, oil
coolers, classification and service ratings of lubricating oil, additives for
lubricants.

7 Special Types of Engines (10 hrs)

Wankel engines, Electrical/Hybrid system, Fuel Cell, Homogenous charge
compression, Ignition engine, Wheel motors.

LIST OF PRACTICALS

1. Identification and sketching of special tools and gauges.
2. Servicing of lubricating/cooling system
3. Servicing of fuel systems in petrol and diesel engines
4. Servicing of fuel injection pump
5. Servicing of F.I.P
6. Engine tune up
7. Study of turbocharger

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on making the students conversant with the principles and practices related to various types of engines. Audio visual aids should be used to show engine features and working. Demonstrations should be made in automobile shop to explain various engine components.

RECOMMENDED BOOKS

1. Automobile Engineering – Vol. II by Dr. Kirpal Singh; Standard Publishers Distributors.
2. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi
3. Automotive Engines by Srinivasan, TMH, Delhi
4. Automobile Engineering by Chikara, Dhanpat Rai and Sons, New Delhi
5. Automobile Engineering by KM Gupta, Umesh Publishers, Delhi
6. Auto Engine –I by G.S. Aulakh, Eagle Prakashan, Jalandhar.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	09	14
2	09	14
3	08	12
4	10	16
5	09	14
6	09	14
7	10	16
Total	64	100

3.6 CHASSIS, BODY AND TRANSMISSION - I

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3 - 2

RATIONALE

Chassis, body and transmission form the core of automobile engineering. The subject focuses at imparting knowledge and skills regarding chassis and body viz. clutch system, transmission system, final drive, steering mechanism.

DETAILED CONTENTS

1. Chassis and Body (08 hrs)

Classification of vehicles, types of chassis, layout of conventional type of chassis, function and arrangement of major assemblies. Alternating arrangement used such as engine position, drive types, their merits and demerits., types of frame and body streamlining, cross members, brackets, materials of frame and body upholstery..

2. Clutch (10 hrs)

Necessity, function and requirements of clutch, types of clutch - single plate clutch, multi plate clutch, hydraulic power assisted and wet and dry plate clutch, clutch plate and lining material

Constructional details and working of centrifugal, semi centrifugal clutch, diaphragm clutch and fluid coupling.

3. Transmission (10 hrs)

Necessity, function and types of manual transmission- Sliding, constant mesh and synchromesh. Over drive, over running clutch, description and operation of transfer gear box. Common faults and remedies.

Types of automatic transmission and their main components

Epicyclic gear box – construction, working and determination of speed ratio.

Torque converter – construction, principle of working. Continuously variable transmission, Automated Manual Transmission

4. Final Drive (08 hrs)

Propeller shaft – function, construction details. Universal joints - functions and types. Types of final drive – hotchkiss drive, torque tube drive. Differential – principle, functions and its working. Rear axles – semi floating, , three quarter floating. fully floating . Common faults and remedies

5. Front Axle (04 hrs)

Types – Stub double drop, fully dropped, load distribution, effect of braking on axle shape, steering head, Elliot and reverse elliot, steering knuckle.

6. Steering

(08 hrs)

Steering mechanism, function, Davis and Ackerman's Principle of steering. Working and constructional details of steering gear, steering linkages, sector arm, center arm, drag link and tie rod steering stops. Front wheel geometry-caster, camber, steering axis inclination, toe in and toe out. Cornering force, cornering power and self-righting torque. Over steering and under steering. Power steering – necessity, types, Construction features and working of hydraulic and electronic power steering systems, Common steering systems troubles and remedies

LIST OF PRACTICALS

1. Study and sketches of Heavy and Light vehicle chassis.
2. Identify and servicing of single plate and multi plate clutch.
3. Study and sketch of centrifugal clutch.
4. Servicing and overhauling of constant mesh and synchromesh gear box
5. Servicing of universal joints, slip joint and propeller shaft
6. Servicing of differential, adjustment of crown and pinion backlash.
7. Checking and adjustment of steering geometry, camber, caster, Toe-in, Toe-out, kingpin inclination.

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of chassis, body and transmission.

RECOMMENDED BOOKS

1. Automobile Engineering, Vol. I- II by Dr. Kirpal Singh, Standard Publishers
1. Automobile Engineering by GBS Narang, Khanna Publishers, Delhi
2. Chassis, Body and Transmission-I by G.S.Aulakh, Eagle Prakashan, Jalandhar.
3. Automobile Engineering by R.B. Gupta, Satya Prakashan, New Delhi.
4. Chassis, Body and Transmission by Ishan Publications, Jalandhar.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	8	18
2	10	20
3	10	20
4	8	18
5	4	08
6	8	16
Total	48	100

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection