

### 3.1 APPLIED MECHANICS

Periods/week      L   T   P  
                             4   -   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** 08 period
  - 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 density, force, pressure, work, power, velocity, acceleration
  - 1.4 Concept of rigid body, scalar and vector quantities
  
2. **Laws of forces** 12 period
  - 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** 10 period
- 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 and beams, fixed support, roller, support, over hanging, Uniformly distributed load, point load, varying load
  - 3.8 Position of resultant force by moment  
*[Simple problems on the above topics]*
4. **Friction** 10 period
- 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, friction in simple screw jack
  - 4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:
    - a) Acting along the inclined plane Horizontally
    - b) At some angle with the inclined plane*[Simple problems on the above topics]*
5. **Centre of Gravity** 08 period
- 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. Moment of Inertia

06 period

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (*without derivations*). Second moment of area for L, T and I sections, section modulus.

## 7. Simple Machines

10 period

- 7.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines
- 7.2 Simple and compound machine (Examples)
- 7.3 Definition of ideal machine, reversible and self locking machine
- 7.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
- 7.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
- 7.6 Working principle and application of wheel and axle, different pulley blocks, 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]

## LIST OF PRACTICALS

- 1. Verification of the following laws:
  - a) Parallelogram law of forces
  - b) Triangle law of forces
  - c) Polygon law of forces
- 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.

### **INSTRUCTIONAL STRATEGY**

1. Use computer based learning aids for effective teaching-learning.
2. Expose the students to real life problems.
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

### **RECOMMENDED BOOKS**

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi.
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1	08	08
2	12	16
3	10	18
4	10	18
5	08	12
6	06	12
7	10	16
<b>Total</b>	<b>64</b>	<b>100</b>

## 3.2 MATERIAL SCIENCE AND METALLURGY

	L	T	P
Periods/week	4	-	3

### RATIONALE

Materials play an important role in the construction and manufacturing of equipment/tools. Right selection of materials add to the economy, working and life of machinery. A diploma holder must be conversant with the properties, uses, availability and costs of materials used for construction/fabrication to enable him to perform his functions confidently. The subject of Engineering Materials has been designed to cover the above aspects.

### DETAILED CONTENTS

#### 1. Importance of Materials

12 Period

- 1.1 Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys.
- 1.2 Crystalline and non-crystalline structures; unit cells, Bravais space lattices, cubic closed pack structures, coordination number, miller indices, crystallographic planes and directions.
- 1.3 Structural imperfections- point, line, planar and volume defects, structure property relationship.
- 1.4 Names of common metals, their alloys and non-metals used in Industry
- 1.5 Properties of metals and alloys
- 1.6 Physical properties - Appearance, luster, colour, density and melting point
- 1.7 Thermal and electrical conductivity
- 1.8 Corrosion, causes, effects and prevention.
- 1.9 Study of creep and fatigue.

#### 2. Ferrous Metals and Alloys

16 Period

- 2.1 Flow diagram for the production of ferrous metals from their ores, constituents of iron, iron carbon diagram.
- 2.2 Classification, composition and uses of cast iron and plain carbon steels. IS, BS and SAE Grades
- 2.3 Effect of alloying elements such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorous on steels.
- 2.4 Composition, properties, and uses of special steels such as High speed steel, Stainless steels, Silicon steels, Heat resistant steels, Spring steel.
- 2.5 Heat Treatment: Iron-carbon diagram, objectives of heat treatment. Brief description and uses with examples of principal heat treatment processes, Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding and applications, case hardenin

### **3. Iron Carbon Equilibrium Diagram**

04 Period

3.1 Phase transformation

3.2 Nucleation and growth

### **4. T-T-T Diagram**

04 Period

4.1 Importance of critical cooling rate.

4.2 Martensite transformation

4.3 Nucleation and growth

### **5. Non-ferrous Metals and Alloys**

16 Period

5.1 Copper: Properties and uses

5.2 Composition, properties and uses of copper alloys.

5.3 Brasses: Cartridge brass, Nickel silver

5.4 Bronzes: Phosphor bronze, Al-bronze, Mn-bronze, and Gun metal.

5.5 Properties and uses of Aluminium.

5.6 Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnalium and Hindalium

5.7 Properties and uses of alloys of lead, tin and magnesium.

5.8 Bearing Metals: Requisite qualities. Composition, properties and uses of white metal bearing, copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bi-metallic and trimetallic bushes

### **6. Other Important Materials**

12 Period

6.1 Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics and their uses and grades.

6.2 Composite materials.

6.3 Heat insulating materials: Properties and uses of asbestos, glass wool, thermo Cole, cork, mica.

6.4 Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt.

6.5 Sound insulating materials: Cork, fibre boards.

6.6 Fabrication materials: Wood, plywood, rubber – natural and synthetic, Glass – plate glass, toughened glass, safety glass.

6.7 Refractory materials: General characteristics and uses of dolomite, ceramics.

6.8 Protective coating materials: Paints, primers, varnishes, enamels, putti, electroplating materials, rubasil, Teflon coating.

6.9 Sealant and adhesives – Application and availability of sealant and adhesives for industrial user.

6.10 Smart materials.

### **LIST OF PRACTICALS**

1. Classification of about 25 specimen of materials/parts into
  - Metals and Non Metals
  - Metals and Alloys
  - Ferrous and non ferrous metals
  - Ferrous and non ferrous alloys

2. Given a set of specimen of metals and alloys (copper, brass, aluminum, cast iron, HSS, Gun metal), identify and indicate the various properties possessed by them
3. Study of heat treatment furnace
4. Study of metallurgical microscope and a specimen polishing machine.
5. To anneal a given specimen and find out difference in hardness as a result of annealing
6. To normalize a given specimen and to find out the difference in hardness as a result of normalizing

### INSTRUCTIONAL STRATEGY

While imparting instructions, teacher should show various types of engineering materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials in the industry.

### RECOMMENDED BOOKS

1. Material Science by R.K.Rajput; Laxmi Publications, Darya Ganj, New Delhi.
2. Advances in material Science by R.K.Dogra and Dr.A.K.Sharma;S.K.kataria & sons; New Delhi.
3. Material Science by GBS Narang; Khanna Publishers New Delhi
4. Material Science and Metallurgy by D.S. Nutt. SK Kataria and Sons, Delhi.
5. Material Science and Engineering by Dr. P.L Shah

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Period)	Marks Allotted (%)
1.	12	15
2.	16	25
3.	04	10
4.	04	10
5.	16	25
6.	12	15
<b>Total</b>	<b>64</b>	<b>100</b>

### 3.3 WORKSHOP TECHNOLOGY

	L	T	P
Periods/week	4	-	6

#### RATIONALE

This subject provides knowledge about various welding processes and foundry work. Welding is very useful for fabrication work and foundry for production of castings used for manufacturing of machines and it is very essential for diploma holders.

#### DETAILED CONTENTS

##### UNIT-1

10 Period

Principle of welding, Classification of welding processes, Advantages and limitations, Industrial applications of welding, Welding positions and techniques, symbols. Gas Welding , Principle of gas welding, Types of gas welding flames and their applications, Gas welding equipments, Gas welding torch, Oxy acetylene cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes.

##### UNIT-2

10 Period

Arc Welding, Principle of operation, Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes, Flux for arc welding. Other Welding processes, Resistance welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding. Shielded metal arc welding, submerged arc welding, welding defects, methods of controlling welding defects and inspection of welded joints.

##### UNIT-3

12 Period

Modern Welding Methods, Principle of operation, advantages, disadvantages and applications of: Tungsten inert gas (TIG) welding, Metal inert gas (MIG) welding, Thermit welding, Electro slag welding.

##### UNIT-4

12 Period

Pattern Making, Types of pattern, Pattern material, Pattern allowances, Pattern codes as per B.I.S. Introduction to cores, core boxes and core materials, Core making procedure , Core prints, positioning of cores. Moulding Sand , Properties of moulding sand, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility etc. Various types of moulding sand and testing of moulding sand. Mould Making, Types of moulds, Molding boxes, hand tools used for mould making, Molding processes: Bench molding, floor molding, pit molding and machine molding.



## UNIT-5

10 Period

Casting Processes Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, Centrifugal casting, Continuous casting process. Gating and Riser system, Elements of gating system, Pouring basin, sprue, runner, gates Types of risers, location of riser, Casting Defects, Different types of casting defects and their reasons, testing of defects: radiography, magnetic particle inspection, and ultrasonic inspection.

## UNIT-6

10 Period

Melting Furnaces Construction and working of: Pit furnace, Cupola furnace, Crucible furnace –tilting type.

### LIST OF PRACTICALS

1. Preliminary joining practice by gas welding.
2. Exercises of gas welding on the following Aluminum, Brass, Copper, C.I.
3. Gas cutting of the following types
  - (a) Preliminary gas cutting practice
  - (b) Stock cutting by oxy acetylene
4. Making following types of joints by arc welding:
  - (a) Preliminary joining practice by arc welding
  - (b) Butt and lap joint (in vertical position, travel up and down)
  - (c) Welding of outside corner joint
5. Exercise on spot welding
6. Exercise on brazing
7. Exercise on TIG/MIG welding
8. Testing & Inspection of welding defects visually
9. Pattern making: Preparation of solid pattern (single piece), Preparation of split pattern

### INSTRUCTIONAL STRATEGY

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audiovisual aids/video films should be made to show specialized operations.

### RECOMMENDED BOOKS

1. Welding Technology by R.L. Aggarwal and Tahil Maghanani; Khanna Publishers, Delhi.
2. Principles of Foundry Technology by Jain; Tata Mc Graw Hill Publishers, New Delhi.
3. Workshop Technology by B S Raghuvanshi; Dhanpat Rai and Sons, Delhi.
4. Manufacturing Technology by M Adithan and AB Gupta, New Age International (P) Ltd.
5. Elements of Workshop Technology by SK Chaudhry and Hajra; Asia Publishing House.
6. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
7. Practical Handbook for Mechanical Engineers by Dr. A B Gupta; Galgotia Publications, New Delhi.

8. Production Technology by HMT; Tata McGraw Publishers, New Delhi.
9. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
10. Workshop Practice by R.K. Singal, S K Kataria and Sons, New Delhi.
11. 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 (Periods)	Marks Allotted (%)
1	10	14
2	10	14
3	12	20
4	12	22
5	10	14
6	10	16
<b>Total</b>	<b>64</b>	<b>100</b>

### 3.4 AUTOMOTIVE ENGINE I (PETROL ENGINES)

L T P  
Periods/week 5 - 3

#### RATIONALE

The power plant or engine is the most important part of Automobile vehicle. This syllabus in Automobile Engine is prepared with the aim to develop average skill in understanding the subject. This subject is the core beginning of this career.

The course will facilitate the student to apply the principles for their further studies and the knowledge will be artful to them in practical field to.

#### DETAILED CONTENTS

1. **Introduction to IC Engines** 14 period  
Engine terms – bore, stroke, dead center, compression ratio, swept volume, clearance volume, capacity, torque, power and the crank shaft.  
Classification and brief description of engine as per stroke, cycle, fuel, ignition, cooling and number and arrangement of cylinders, valve arrangement.  
**Constructional Details**  
Constructional details of cylinder block, cylinder head, cylinder liner, piston, piston coatings, piston rings, gudgeon pin, connecting rod, crankshaft, camshaft, valve mechanism, flywheel and damper.
2. **Engine Construction and Operation** 20 period  
Four stroke and two stroke petrol engine- working principle, construction and operation. Scavenging, comparison of four stroke and two stroke engine operation, firing order and its significance. Valve Timing diagram of petrol engines. Comparison of two & four stroke petrol engine.
3. **Cooling and Lubrication System** 16 period  
Need for cooling system, Study of cooling system components, Types of cooling system: air cooling system, liquid cooling system, and pressurized cooling system, antifreeze mixture.  
Need of Lubrication system, properties of lubricating oil, additives, Types of lubrication system: pressure lubrication system, dry &, wet sump lubrication system.
4. **SI Engine Fuel System** 16 period  
Properties of Ideal gasoline, Fuel feed systems; mechanical and electrical fuel feed pumps. Carburetor Function & working principle, starting, idling, acceleration and normal circuits of carburetors. Study of Solex, Carter Carburetors. Concept of Petrol injection, MPFI.
5. **Combustion and Combustion Chambers** 14 period  
Combustion in SI engine; stages of combustion, flame propagation, rate of pressure rise, delay period, abnormal combustion, Pre-ignition, knocking, Octane number, effect of engine variables on knocking, Fuel additives. Combustion chambers for petrol engines & its different types.

## LIST OF PRACTICALS

1. Study of two stroke petrol engine
2. Study of four stroke petrol engine.
3. Study of fuel feed system of petrol engine.
4. Study of lubrication system of petrol engine.
5. Study of cooling system of petrol engine.
6. To draw valve timing diagram.

## RECOMMENDED BOOKS

1. Heldt P.M., “High Speed Combustion Engines”, Oxford IBH Publishing Co., Calcutta,
2. William H.Crouse, “Automotive Engines”, McGraw-Hill Publishers,
3. Ellinger H.E., “Automotive Engines”, Prentice Hall Publishers,
4. John B.Heywood, “Internal Combustion Engine Fundamental”, McGraw-Hill,
5. Ganesan.V. “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co.,
6. M.L.Mathur and R.P.Sharma, “A course in Internal combustion engines”, Dhanpat Rai & Sons Publications, New Delhi
7. Automobile Engineering by P.S. Gill
8. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh; Standard Publishers Distributors
9. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi.
10. Automobile Engineering by K.M. Gupta, Umesh Prakashan, Delhi.

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Period)	Marks Allotted (%)
1	14	18
2	20	24
3	16	20
4	16	18
5	14	20
<b>Total</b>	<b>80</b>	<b>100</b>

### 3.5 PRINCIPLES OF THERMAL ENGINEERING

	L	T	P
Periods/week	4	-	2

#### 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** 10 periods  
Concept of thermodynamics, heat, temperature, intensive and extensive properties, path, process, system, surroundings, enthalpy, internal energy and thermodynamic work
- 2 Gas Laws** 10 periods  
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** 12 periods  
Zeroth law of thermodynamics, Irreversible process, First law of thermodynamics, Second law of thermodynamics (concept only), Thermal efficiency, Heat pump, heat engine and Refrigerator, concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic, throttling and free expansion processes. Numerical based on above processes
- 4 Air Cycles** 12 periods  
Carnot cycle – concept only, Otto cycle, Diesel cycle, Dual combustion cycle, Numericals based on above cycles
- 5 Air Compressors** 10 periods  
Reciprocating air compressor, Centrifugal compressor, Rotary air compressor - its types. Working of single stage and double stage compressor and applications.
- 6 Heat Transfer** 10 periods  
Modes of heat transfer – Conduction, convection, radiation, Fourier's Law, Numerical based on Fourier's Law

## LIST OF PRACTICALS

1. Study of Otto Cycle
2. Study of Centrifugal air compressor
3. Study of Reciprocating air compressor
4. Study of Heat Pump, Heat Engine & Refrigerator
5. Study of different modes of heat transfer

## 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.

## RECOMMENDED 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 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 (Periods)	Marks Allotted (%)
1	10	14
2	10	14
3	12	20
4	12	22
5	10	14
6	10	16
<b>Total</b>	<b>64</b>	<b>100</b>

### 3.6 AUTOMOTIVE CHASSIS I

L T P  
Periods/week 4 - 3

#### RATIONALE

In teaching fundamentals of Automobile Engineering, chassis is an essential topic. It is divided in two parts. In this part we have included components of power transmission. The student will learn about clutch, gear box, propeller shaft, universal joint, differential, rear axle, wheels & tyre.

#### DETAILED CONTENTS

- 1. Introduction** 10 Periods  
Types of chassis layout with reference to power plant locations and drives. Types of chassis, layout of conventional type of chassis, function and arrangement of major assemblies.
- 2. Transmission Units** 20 Periods  
Need of transmission system, Features of transmission components  
**Clutch:** - Requirements of clutches - Principle of friction clutch - Types: Cone clutch, Single-plate clutch, Diaphragm spring clutch, Multiplate clutch, Centrifugal clutches, Need of Fluid coupling – Principle, construction & working of fluid coupling.  
**Gear box:** - Requirements of Gear boxes, Different types of gear boxes, construction & working of Sliding mesh, Constant mesh & synchromesh gear box, Transfer case assembly, Epicyclic Gear Box, Automatic Transmission, Introduction to Torque converter.
- 3. Drive Line** 14 Periods  
Need of universal joints, fluctuations in angular speed, construction & working of constant velocity universal joints, Need of propeller shaft, its construction & whirling speed. Need of rear axle & its types, construction & working of full floating, three quarter floating and semi floating rear axles.
- 4. Differential Assembly** 10 Periods  
Differential-Its need, purpose & Principles, Theory of Sun & Planet gears, Construction & working details of differential Unit, Limitation of differential, Non-slip differential, differential locks.
- 5. Wheels & Tyres** 10 Periods  
Types of wheels, load distribution on front & Rear wheels, construction of wheel assembly. Spoked wheel, disc wheel & alloy wheel. Wheel balancing. Construction & material of solid, tubed & tubeless tyres. Types of tyre wear and their causes. Hot & Cold retreading. Tyre rotation, Tyre specification and aspect ratio.

## LIST OF PRACTICALS

1. Study of clutch assembly regarding its construction, components and operation.
2. Study of constant mesh, synchromesh and sliding mesh gear boxes regarding their construction, components and operation.
3. Study of universal joints regarding its construction, components and operation.
4. Study of propeller shaft and slip joint regarding its construction and operation.
5. Study of differential regarding its construction, components and operation.
6. Study of wheel rims and tires their shape, size and specification.

## INSTRUCTIONAL STRATEGY

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

## RECOMMENDED BOOKS

1. Heldt.P.M.- “Automotive Chassis”- Chilton Co., New York
2. K.K.Ramalingam - “Automobile Engineering” – Scitech Publication, Chennai
3. Steed W - “Mechanics of Road Vehicles”- Illiffe Books Ltd., London
4. Newton Steeds and Garrot- “Motor Vehicles”- Butterworths, London
5. Judge A.W- “Mechanism of the Car”- Chapman and Halls Ltd., London
6. Giles.J.G- “Steering, Suspension and tyres”- Iiiffe Book Co., London
7. Automobile Engineering by P.S. GILL
8. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh; Standard Publishers Distributors,
9. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi.
10. Automobile Engineering by K.M. Gupta, Umesh Prakashan, Delhi.

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	10
2	20	30
3	14	15
4	10	20
5	10	25
<b>Total</b>	<b>64</b>	<b>100</b>