COURSE STRUCTURE & SYLLABUS OF BACHELOR OF TECHNOLOGY (B.TECH)

In

Mechanical

Course Structure

Second Year

Fourth Semester

Paper Code	Subject
BSM6	Society, Environment, Engineering
BSM7	Dynamics
BSM8	Solid Mechanics
BSM9	Heat Transfer-I
BSM10	Theory of Machine

Syllabus

BSM6 : SOCIETY, ENVIRONMENT & ENGINEERING

1.DEFINITION AND SCOPE OF SOCIOLOGY:

Introduction, History of Sociology, Meaning of Sociology, Definition of Sociology, Nature of Sociology, Scope of Sociology, Specialistic OR Formalistic School, Synthetic School of Thought, Conclusion on Scope of Sociology, Differences between Social Sciences and Physical Sciences, Sociology and Other Social Sciences, Sociology and Psychology, Sociology and Anthropology, Sociology and Political Science, Advantages of Study of Sociology, Utility of Study of Sociology to Engineers, Study of Sociology and Democracy, Study of Sociology in India, Methods of Predicting: Preferred and Expected Future.

2. BASIC SOCIOLOGICAL CONCEPT:

Introduction, Society, Basic Characteristics of Society, Factors affecting Social Life of a man, Social factors, Biological factors, External factors, Industrial societies/Technological society, Community, Characteristics of a Community, Comparison between Society and Community, Association, Characteristics of Association, Comparison between Association and Community, Institution, Characteristics of Institution, Significance of Institution, Distinction between Institution and Community, Customs, Difference between Institution and Customs, Customs in Indian Society, Habit, Types of Habits, Difference between Customs and Habits, Folkways, Mores. Distinction between Folkways and Mores, Fashions, Social Utility of Fashion, Factor which cause Fashion to spread in Modern Society, Crowd, Characteristics of Crowd, Theories of Crowd behaviour, Comparison between Crowd and Public, Audience, Mob, Social groups, Classification of Social group, 'Cooley's' classification:- Primary v/s Secondary group, Difference between Primary and Secondary group, Social Structure, Role Systems, Role Conflict and Role Strain, Tribe.

3. SOCIAL INSTITUTION:

Introduction, Types of social institution, Origin of society, Theory of Divine origin, Force theory, Patriarchal and Matriarchal theories, theory of social contract, Organic theory, Group mind theory modern theory, Socialization, Types of socialization process of socialization, Factors responsible to socialization, Advantages of socialization. Family characteristics of a family, classification of family, Functions of family, changing characteristic of modern family, future of family, joint family, characteristics of joint family, Advantages of joint family, Disadvantages of joint family, Nuclear family or conjugal family, Marriage forms of marriage,

Advantages of monogamy, selection of marriage. Partners. Divorce Reasons for Divorce, Marriage system in India, Hindu marriages Act. Divorce under marriage act 1955. Marriage and family in India – some recent trends, dowry, how to curb this customs, religion, characteristics of religion, Religion and morality, Distinction between Religion and morality. Education functionalist aspects of Education – Role of social control. Challenges to Education, Reforming Educational system – practical measures to remove illiteracy. Measures to reduce illiteracy – full Literacy, Multiplicity of Language – 3 language formula. Write in diversity.

4.SOCIAL CHANGE

Factors of social change, social movements, Types of social movements. Theories of social change, Resistance to social change. General continues responsible for social change. Causes responsible for opposition to social changes. When are changes favoured ? Conflicts, causes of conflict, forms of conflict, co-operation social advantages of co-operation. Conflict and co-operation, competition, Distinction between competition and conflict, social progress, social invention, social evolution, characteristics of social evolution, difference between social evolution & social progress, social evolution & social change, Effects of conflict in social change, role of sociologists in Promoting social change, Social disorganization, Causes of social disorganization, Symptoms of social disorganization, Difference between social organization and Disorganization.

5.SOCIAL CONTROL:

Social control and self control necessity of social contril, means of social control informal means of social control formal methods of Social control. Agencie of social control, person's views about systems, cybernetic communication and control

6. SOCIAL PROBLEMS:

Deviance, social problems classification of social problems, causes of social problems some important social problem, major social problems.

7. CULTURE:

What culture is ?, characteristics of culture. Concept connected with culture characteristics of lag, causes of culture lag, civilization.

Difference between culture and civilization .Acquired behaviour, culture Diffusion.

8. CAPITALISM , MARXISM AND SOCIALISM:

Some important features of capitalism. Advantages of capitalism , Disadvantages of capitalism , communism or Marxism. Basic features of communism, Difference between capitalism of communism , socialism, silent features of socialism. Difference between socialism and communism.

9.SOCIALOGY AND TECHNICAL CHANGES:

Science and society, Advantages of science and technology in the economic Development, Technology and women, Influence of Technology on social Institutions, Influence of family systems, Demerits, Influence of technology on religion influence of technology on rural life. Influence of Technology on Urban life, social effects of technology, Technology and planning process of nation.

10. HISTORICAL PERSPECTIVE:

Introduction , phases in development of Technology , Science & technology in India after independence . Technology policy statement 1983. Role of Science and technology in development.Super conductivity programme , Instrument development program. Natural resources date management systems , Nuclear power program, Indian space program.Technology. Development in Electronics , Results of planning , science policy resolution of 1958, manpower Development , Impact of Science & Technology in various sectors.

11.TECHNOLOGY ASSESSMENT AND TRANSFER:

Introduction, meaning of Technology Assessment and Transfer what Technology is information Technology, Technology Assessment, Importance of Technology, Technology forecasting and upgradation, Appropriate. Technology, criteria for success of Technology Transfer, Transfer of technology from laboratory to field.

12.CYBERNETICS:

Introduction, what cybernetics is ? control system

13.ENGINEER IN SOCIETY:

Introduction, optimisation, Limitations of optimization, concepts of optimisation. Advantages of optimisation, Methods of optimisation operation research, optimisation of Human Resources. Important of Human Resources, Human Resources planning, Needs and strategies for Human Resources planning, factors affecting manpower planning. Responsibility for Human Resource planning, work rules, wage, factors affecting wages, methods of wage fixation optimum use of capital resources, capital, Types of capital, capitalisation, Banking

Classification of bank: Credit instruments optimum utilization of material resources, material Handling, Principles & functions of materials Handling material Handling Devices, manual handling, mechanical handling, conveying equipment, Transportation and transferring equipment, Lifting, lowering or elevating equipment, Productivity, Labour productivity, importance of productivity, Benefits of productivity measures of increase of productivity, Automation, formulation of problem, formulation of problems and alternative solution. Strategies, Alternative solution strategies; The principle of limiting factor, the basic process of Evaluation; maintenance of Public system, Defence & Security requirements.

14.INFLATION AND POVERTY:

Inflation, causes of Inflation in India, measures to control inflation and deflation; poverty, Industrialisation of country; conclusion.

15.ENVIRONMENTAL DEGRADATION AND CONTROL:

Meaning of Environment ; Environment pollution, pollution, classification of pollutants; Effects of pollution on Living systems, causes of Environmental pollution , Kinds of pollution, suggestion for improving , atmospheric pollution , Environmental control monitoring of environmental pollution , Air pollution, classification of air pollutants, sources of Air pollutants, Geographical factors affecting air pollution , Effects of Air pollution , water pollution, sources of water pollution, Effect of water pollution , water Analysis, waste water; its treatment and Environments, waste water treatment , stages of waste , water treatment , treatment and disposal of sewage, treatment of sewage. Industrial waste treatment and Disposal , Treatment of Efflent, Standards for drinking water, water treatment process, some suggestions for reducing water pollution , Role of Engineer in Environmental protection , Ecological imbalance and its Effects,

16.PLANT LAYOUT AND SITE SELECTION:

Introduction, Nature of location decisions, choice of site for location, Urban Area, selection of Site in Rural Area, Suburban Area, Comparison of site for location of facilities, models of location of service facilities, Economic survey for site selection, plant layout, Advantages of good layout, Principles of plant layout, Types of pant layout, Fixed position Layout process layout, product layout, combination layout, Selection of space requirement in layouts.

17. PERSONAL MANAGEMENT:

Defination of personnel management, importance of personnel management, principle of personnel management objectives of personnel management functions of personnel management, Recruitment and selection of employees. Manpower planning ; objectives of manpower planning , Types of manpower planning , steps in manpower planning , Procedure of appointing an employee in a factory , Training and Development, principles of Training , methods of Training , Industrial safety , Accident Human causes, Effect of accidents, Effect to the Industry , Effect on worker, cost of society, Types of Accidents , Safety procedures.

Ways to prevent or minimize Accidents, Accident reporting and Investigation, Investigation of causes Precautionary measures for maintaining. Industrial Health, Incentives premium OR Incentive Bonus system, Essential s of a Good Incentive systems, Understanding duties of other officials in Department. Duties of Maintenance Engineer. Duties of safety officer, Duties of Security officer.

18.INDUSTRIAL ACTS:

Introduction, Indian Boiler Act 1923, The Indian factories Act 1948, Health provisions. Important provisions of the factory Act regarding safety of workers, welfare provisions, penalties for breach of provisions of the act, Indian Electricity Act, Suppy & Use of Energy, The Employee's State Insurance Act 1948, Workmen's compensation Act, The Industrial Dispute Act, 1947, Strikes and Lockouts, The payment of wages Act 1936, The Indian Trade Union Act, 1926, Minimum Wages Act 1948.

19.STANDARDS:

Indian standard Institution, BIS Publications, ISO-9000 Quality systems.

20.FUNCTIONS OF MANAGEMENT:

Difference between Management , Administration, Organisation, Functions of management , Planning , Production planning and control , steps in production planning and control , Routing procedure of Routing , Scheduling & Loading scheduling and loading , Advantages of planning. Management by objectives, forecasting , Types of forecasting , organizing , meaning of organization, purpose of organizing, Advantages of organization. Classification of organization , Hirarchy systems of organization, Advantages & Disadvantages of scalar systems , Types of organization structures, functional organization, communication objectives of communication, communication process model superior subordinate communication , Types of communication systems , Disadvantages of oral communication systems, co-ordination, Tools of co-ordination, Types of co-ordination, rechniques of co-ordination, co-ordination/S co-operation. Motivation Importance of motivation, Techniques of motivation, Methods of participation, Extent of worker's participation in management, worker's participation in Indian Industries, Human needs, Importance of fulfillment of needs, moslow's theory of motivation, Leadership, leadership Style.

BSM7 : DYNAMICS

INTRODUCTION TO DYNAMICS AND BASIC

Introduction, Mechanics, History Of Mechanics, Basic Concepts And Principles, Laws Of Mechanics, Units And Dimensions, Scalars And Vectors, Basic Vector Operations, Vectorial Representation Of Forces, Vectorial Representation Of Moments, Procedure For Solving Problems In Mechanics

1. KINETICS OF PARTICLES

Introduction, Objective, Rectilinear Motion Of Particles _ Displacement, Velocity And Acceleration, Determination Of The Motion Of A Particle, Uniform Rectilinear Motion, Uniformly Accelerated Rectilinear Motion, Relative Motion, Curvilinear Motion, Position Vector, Velocity And Acceleration, Derivatives Of Vector Functions, Rectangular Components Of Velocity And Acceleration

2. KINETIC OF PARTICLES: NEWTON'S SECOND LAW

Introduction, Objective, Newton's Second Low Of Motion, Equation Of Motion, Angular Momentum Of A Particle, Equations Of Motion In Terms Of Radial And Transverse Components, Motion Under A Central Force-Conservation Of Angular Momentum

3. KINETICS OF PARTICLE: ENERGY & MOMENTUM METHODS

Introduction, Objective, work of a force, kinetic energy of a particle : principle of work and energy, Power and efficiency, potential energy, conservative forces, conservation of energy, motion under a conservative central force – application to space mechanics, principle of impulse and momentum, impulsive motion, impact of elastic bodies, direct centre impact, oblique central impact

4. SYSTEM OF PARTICLES

Introduction, Objective, Application Of Newton's Laws To The Motion Of A System Of Particles, Linear Angular Momentum Of A System Of Particles, Motion Of The Mass Centre Of A System Of Particles, Conservative Of Momentum For A System Of Particles, Work-Energy Principle: Conservation Of Energy For A System Of Particles, Principle Of Impulse And Momentum For A System Of Particles

5. KINETICS FO RIGID BODIES

Introduction, Objective, Definition Of Terms, Translation Fixed Rotation, Equations Defining The Rotation Of Rigid Body About A Fixed Axis- Velocity And Acceleration, Absolution And Relative Motion Methods For Plane Motion Analysis, Relative Velocity In Plane Motion, Instantaneous Centre Of Rotation In Plane Motion, Relative Acceleration In Plane Motion, Rate Of Change Of A Vector With Respect To A Rotating Flame, Plane Motion Of A Particle Relative To A Rotating Frame – Coriolis Acceleration

6. KINETICS OF RIGID BODIES

Introduction, Objective, equation of motion for a rigid body, moment of momentum equations, plane motion of rigid body- D'alembert's principle, systems of rigid bodies, constrained plane motion and rotational of rigid body, work of forces active on rigid body, kinetic energy of a rigid body in plane motion, principle of work and energy for a rigid body, systems of rigid bodies

7. IMPACT OF TWO BODIES

Introduction, Objectives, Concepts Of Impact, Coefficient Of Restitution, Coefficient Of Restitution, Observations And Calculations, Plane Centrel Collision, Collision Of A Small Body With A Massive Body

8. CENTRE FORCE MOTION

Introduction, Objectives, Basic Concepts, Acceleration Due To Gravity, Trajectories For Central Force Motion, Parabolic Trajectory, Elliptical Orbit, Hyperbolic Trajectory, Energy Expended For Different Trajectories Launching Of Satellites At An Angle, Astronomical Facts And Laws Of Kepler

BSM8 : SOLID MECHANICS

1. ANALYSIS OF STRESS

Introduction, stress, complementary shear stress, simple shear, the state of pure shear, principal stresses and principal planes, sign convention, Mohr's circle for biaxial stresses, Mohr's circle.

2. ANALYSIS OF STRAIN

Introduction, Strain On An Oblique Plane, Mohr's Circle Of Strain, Compatibility Equations

3. STRESS – STRAIN RELATIONS FOR LINEARLY ELASTIC SOLIDS

Introduction, Hooke's Law, Poisson's Ratio, Differential Equation Of Equilibrium, The Stress Function-Plane Stress

4. THEORY OF FAILURE

Introduction, Maximum Principal Stress Theory, Maximum Shearing Stress Theory, Maximum Strain Theory, Significance Of Theories Of Failure, Factor Of Safety

5. ELASTIC STABILITY

Introduction, Failure Of A Column Or Strut, Euler's Column Theory, A Sign Conventions, Limitation Of Euler's Formula, Empirical Formula For Columns, Rankine's Formula For Columns, Euler's Formula

BSM9 : HEAT TRANSFER

1.PRINCIPLES OF HEAT TRANSFER:

Introduction, Modes of Heat Transfer, Fourier Law of Heat Conduction, Newtion's Law of Cooling for Convection, Thermal Radiation, Electrical Analogy, Heat Transfer by Combined Modes and Through Composite Bodies.

2.GENERAL HEAT CONDUCTION EQUATION:

Introduction, General Heat Conduction Equation for an Anisotropic Materials in Cartesian Co- ordinates, General Heat Conduction Equation in Cylindrical Co- ordinates, General Heat Conduction Equadion in Spherical Co- ordinates, Thermal Diffusivity, Initial and Boundary Conditions.

3. STEADY – STATE CONDUCTION:

Introduction, Heat flow through a Slab or a Plane Wall, Heat flow through Radial Systems – Cylinders Heat Flow Through Radial Systems, Spheres, Heat Flow through Composite Wall, Overall Heat Transfer Coefficient, Heat Flow through Wall with Variable Thermal Conductivity, Critical Thickness of Insulation, Steady state Conduction with Internal Heat Generation, Steady – state Conduction – Two Dimension.

4. STEADY -STATE CONDUCTION WITH HEAT DISSIPATION TO ENVIRONMENT:

The Controlling Coefficients, A Thin Rod, The Rectangular Fin, The Circular Fin, Fin Efficiency and Effectiveness, Condition for Using Fins.

5. UNSTEADY STATE CONDUCTION:

Unsteady – State Process, Solids of Infinite Thermal Conductivity- Lumped Heat Capacity Analysis, Solution of Unsteady – State One Dimensional Heat Conduction Equation.

6. FORCED CONVECTION:

Convection, Hydrodynamic Boundry Layer, Thermal Boundry Layer, Determination of Dimensionless Correlation for Forced Convection, Empirical Correlations for Flow Inside Tubes, Empirical Correlation for Flow Outside Tubes, Differential Equations, of Boundry Layer on a Flate Plate, Solution of Differential Equations of Boundry Layer, The Integra; Equations of the Boundry Layer, Analogy between Fluid Friction and Heat Transfer , Heat Transfer in Laminar Flow in Tubes, Solution for Constant Wall Temperature, Heat Transfer in Turbulent Flow in Tubes.

7. FREE OR NATURAL CONVECTION:

Characteristic Parameters in Natural Convection, Determination of Dimensionless Correlation for Free Convection, Empirical Correlations for Free convection, Momentum and Energy Equations for Laminar, Free Convection Heat Transfer on a Vertical Flate Plate, Integral Equations for Momentum and Energy on a Flat Plate.

8. THERMAL RADIATION:

Thermal Radiation in Electromagnetic Spectrum, Radiation Properties, Planck's Law for Monochromatic Thermal Radiation of a Black Body, Emissive Power an Radiation Intensity, Monochromatic Emissive Power of a Black Body, Stefan- Boltzman Law of Black Body Radiation, Heat Exchange by Radiation between Black Surfaces, Radiation Shape Factor and Reciprocity Theorem, Heat Exchange between Non- black Bodies, Heat Exchange by Radiation between Gray Surfaces, Radiation Shields, Radiation from Gases and Vapours.

9.MASS TRANSFER BY MOLCULAR DIFFUSION:

Introduction to Mass Transfer, Fick's Law of Diffusion, Definitions of Quantities, Fick's Law in Terms of Mass and Mole Fractions, Equivalence of Diffusion in Stationary-Media - Species Conservation Equation, Diffusion in Binary Gas mixture.

BSM10 : THEORY OF MACHINES

1.ANALYSIS AND SYNTHESIS OF MACHINES:

Machine, Scope of Theory of Machines, Branches of Theory of Machine, Lome, Kinematics of Machines, Dynamic of Machines, Static's and Kinetics, Resistant Bodies, Link of Element Machine, Frame, Kinematic Pair and its Classification, Different Types of Kinematic Pairs – Unclosed Pairs, Rollin, Screw or Helical and Spherical, Lower and Higher Pairs, Closed and Unclosed Pairs, Motion and its Types, Constrained Motion, Completely Constrained, Partiallly or successfully Constrained and Incompletely Constrained, Kinematic Chains and their Inversions, Quadric Cycle Chain, Beam Engine, Coupled Wheels, of Locmotives, Watt Parallel Motion, Slider Crank Chain and its Inversion- Pendulum pump, Oscillatory Cylinder Engine, Quick Return Motion (Crank and Slotted Lever Type and Whitworth Type), Gnome Engine, Double Slider Crank Chain and its Inversions- Oldham's Coupling, Elliptical Trammel, Donkey Pump Machine, Difference between Machine and Mechanism.

2. VELOCITY AND ACCELARATION OF LINKS IN MECHANISMS:

Displacement , Velocity and Acceleration, Representation of Linear Velocity and Acceleration by Vector, Motion of a Link of a Machine, Determination of Velocities of Links of a Mechanism , Relative Velocity Method of Determination of Velocities of Links of Mechanism, Velocity of Any Point in Link, Application of Relative Velocity Method – Four Bar linkage, Stone Crusher Mechanism, Reciprocating Pump Mechanism, Velocity Diagram for Quick Return Motion of Crank and Slotted Lever Type , Determination of Ratio of Times and Maximum Velocities for Quick Return Motion – Crank and Slotted Lever Type, Instantaneous Centre Method, Application of Instanteous Centre Method, Four Bar Linkage, Reciprocating Engine Mechanism , Sewing Machine Needle Box Mechanism , Toggle Machine Mechanism , Another Simpler Method to find Piston Velocity of

Reciprocating Engine Mechanism, Velocity Diagram of Mechanism for Feeding Paper Wrapping Machine, Velocity Diagram of four Bar Linkage by Simple Method, Total Acceleration of a Point in Rigid Link, Absolute Acceleration of a Point in a Rigid Link, Method of Drawing an Acceleration Diagram of a Given Mechanism, Acceration Centre of Link,Klein's Construction of Reciprocating Engine Mechanism, Acceleration Diagram of a Four Bar Linkage, Acceleration Diagram of Four Bar Linkage by Klein's Construction, Coriolis Acceleration, Determination of Magnitude of Coriolis Component.

3. LOWER PAIRS:

Introduction, Pantagraph, Straight Line Motion, Copied and Generated Straight Line Motion, Peaucillier Mechanism, Hart Meachism, Scott-Russel Mechanism including Modified Form, Elliptical Trammel, Scott-Russel Mechanism, General Case, Grasshopper Mechanism, Watt Mechanism, Tchebichelf Mechanism, Kemp's Translation Linkages, Parallel Linkages, Parallel Rules, Universal Drafting Machine, Lazy Tongs, Engine Pressure Indicators, Simplex Indicator, Crosby Indicator, Richard Indicator, Thomson Indicator, Dobbie – Mclonnes Indicator, Automobiles Steering Gear, Davis Steering Gear, Ackermann Steering Gear, Hooke's Joint or Universal Coupling, Determination of Velocity Ration of Driving and Driven Shafts, Salient Features of Driven Shaft Speed, Angular Acceleration of Driven Shaft, Double Hooke's Joint.

4.GLROSCOPIC AND PRECESSIONAL MOTIONS:

Angular Accerleration and Its Vector Representation, Definition: Axis of Spin, Gyroscopic Effect, Precession, Axis of Precession and Gyroscope, Gyroscope Couple of a Plane Disc, Gyroscopic, Effect on the Movements of a Naval Ship, Ship Stabilization, Stability of Automobile or Locomotive taking a Turn, Effect of Precession by a body Fixed Rigidly at a Certain Angle to a Revolving Shaft.

5.DYNAMIC OF RECIPROCATING PARTS:

Introduction, Displacement, Velocity and Accelaration of Reciporcating Parts in a Reciprocating Engine, Fourier Series for Velocity and Accelerating of Reciprocating Parts of an Engine, Augular Displacement, Velocity and Acceleration of Connection, Pistion Effort, Equilibrium of Forces at Crosshead Pin or Gudgeon, Crank Effort for any Crank Position, Graphical Construction for Determination of Crank Effort for any Crank Position, Crank Effort, Diagrams, Method of Drawing Crank Effort Diagrams, Turning Moment Diagram for a Double Acting Vertical Steam Engine, Turning Moment Diagram for a Four Stroke Cycle Internal Combustion Engine, Turning Moment Diagram for a Multicylinder Engine, Use of Crank Effort Diagram, Flywheel, Types of Flywheels, Size of Flywheels.

6.GOVERNORS:

Distinction between Functions of a Flywheel and a Governor , Types of Governors- Centrifugal and Inertia Governors, Pendulum and Dead Weight Type Centrifugal Governor , Simple Watt Governor, Simple Watt Governor, Determination of Weight of Arm, Open and Crossed Arm Type Watt Governor, Limitations of a SimpleWatt Governor, Determination of Speed of Porter Governor by Method, of Resolution of Forces, determination of Speed of Porter Governor, Hartnell Governor, Principle of Action of Hartmell Governor, Wilson-Hartnell Governor, Governor with Gravity and Spring Control , Hartung Governor, Pickering Governor, Derivation of Equilibrium Speed for Pickering Governor , Inertial Governor , Controlling Forces , Quality of Governor , Sensitiveness , Insensitiveness due to Friction, Stabililty, Isochronous Governor and Hunting of Governor , Effort of Governor, Power of Governor.

7.BELTS , ROPES AND CHAINS:

Higher Pairs, Types of Drive with Higher Pairs, Flexible or Wrapping Connectors, Types of Flexible Connectors, Belts and Ropes, Material of Belts, Neutral Section and Pitch Surface, Types of Drive, Parallel Drive with Open & Crossed Belts, Idler Pulley, Intermediate or Countershaft Pulley, Angle of Right Angle Drives, Quarter Turn Drive, Velocity Ratio, Large Velocity Ratios, Crowning of Pulleys, Loose and Fast Pulleys, Slip, Determination of Belt Length – Exact Length of Open Belt, Approximate Length of Open Belt and Length of Crossed Belt, Stepped or Cone Pulley's ,Design of Stepped Pulleys, Open and Crossed Belts, V-Belts, Advantages of V- Belt over Flat Belt, Ratio of Friction Tension on Tight and Slack Sides of Belts, Horse Power Transmitted, Angle of Contact, Centrifugal Tension, Initial Tension, Creep, Determination of Creep.

8.BRAKES AND DYNAMOMETERS:

(A) Brakes

Brakes and Dynamometers, Types of Brakes, Block or Shoe Brake, Band Brake, Bank and Block Brake, Internal Expanding Shoe Brake, Determination of Pressure and Torque of Internal Expanding Shoe Brake, Effect of Braking.

(B) Dynamometers.

Types of Dynamometer- Absorption and Transmission Types, Prony Brake Dynamometer, Determination of Brake Test Curves, Rope Brake Dynamometer, Critical Speed of Pulley, Advantages, Tesla Fluid Friction Dynamometer , Froude Water Voriex Dynamometer, Swinging, Field, Electrical Dynamometer, Absorption and Transmission Types, Electrical Dynamometer, Bevis- Gibson Flash - Light Torsion Dynamometer , Amsier Torsion Dynamometer.

9.CAMS:

Cam Mechanism and its Uses, Types of Cams and Followers, Definition , Base Circle and Least Radius , Lift Angles of Ascent, Dwell , Descent and Action, Main Consideration Affecting Choice of Cam Profiles, Pressure Angle , Base Circle Diameter, Kinematic Study of Cams, Usual Motions for Followers , Simple Harmonic Motion for the Followers, Displacement , Velocity and Acceleration Diagram, Uniformly Accelerated and Decelerated Motion for the Follower, Uniform Velocity Motion for the Follower , Sine Acceleration or Cyclodical Motion for the Follower, Profile of a Cam Operating a Roller Follower , Profile of an Offset Cam Operating a Roller Follower , Profile of a Cam Operating on Oscillating Roller Follower , Graphical Construction for Tangent Cam with a Roller Follower , Determination of Motion of a Follower Operated by a Cam of any Profile.

10.TOOTHED GEARS.

Toothed Gears and their Uses, Types of Toothed Gears, Spur Gears, Internal Spur Gears, Spur Rack, Bevel Gears, Helical Gears, Double Helical Gears, Worm Gears, Definition, Pitch Circle Diameter, Pitch Surface, Pitch Point, Pitch: Circular Pitch, Diameter Pitch, Module, Addendum, Dedendum, Clearance, Addendum Circle, Outside Diameter, Internal Diameter, Dedendum Circle, Root Diameter, Root Diameter for Internal Gears . Base Circle Diameter, Base Pitch, Centre Distance, Centre Distance for Internal Gears, Backlash, Face to Tooth, Circular Width of Tooth Space, Flank of Tooth, Full Depth of Tooth, Circular Thickness of Tooth, Fillet, Angle of Obliquity or Pressure Angle, Path of Contact, Arc of Contact, Arc of Approach, Arc of Recess, Condition for Correct Gearing and Resulting Velocity of Sliding, Forms of Teeth, Cycloid and its Variants, Epicycloid and Hydpocyloid, Cycloidal Teeth, Path of Contact of Cycloidal Gears, Involute, Method of Drawing and Involute, Involute Function, Main Characteristics of Involute Teeth, Interference in Involute Gears, Minimum Number of Teeth on a Gear Wheel, Length of Arc of contact, Gauging of Straight Spur Gear Teeth, Comparison of Involute and Cycloid Gear Systems, Helical Teeth, Definition, Helical Gear, Axial Pitch, Normal Pitch, Lead, Helix Angle, Spiral Gears, Expression for Centre Distance Between Two Shafts Connected by Spiral Gears, Efficiency of a Pair of Spiral Gears in Mesh, Worm and Worm Gears, Methods of Manufacturers of Gears, Forming by Means of Rotary Disc Cutter, Cutting of Teeth by a Hob, Correction of Spur Gear Teeth or Methods of Avoiding Interference, Stub -Teeth, Increase of Pressure Angle of Gears, Increase of Centre Distance of Gears, Positive and Negative Correction.

11.GEAR TRAINS:

Introduction, Train Value, Limitations in Design of Gear Train, Types of Gear Trains, Simple Gear Train, Compound Gear Train, Reverted Gear Train, Sliding Gear Box for Automobile, Epicyclic Gear Train, Methods of Finding Train Value or Velocity Ratio of an Epicyclic Gear Train, Torques and Tooth Loads in Epicyclic Gear, Trains, Inertia Effects in Epicyclic Gearing, Sun and Planet Gear, Pre-Selective Gear Box, Differential Gear on an Automobile.

12.BALANCING:

Balancing and its Classification, Need for Balancing, Balancing of a Single Rotating Weight by another Rotating Weight in the Same Plane, Balancing on a number of Weights Rotating in One Plane by Another Weight Rotating in the same Plane, Balancing a Number of Weights Rotating in Different Planes, Balancing of Reciprocating Parts, Partial Balancing of Primary Forces. Balancing of Locomotives, Effect of Partial Balancing of Primary Forces, Balancing of Reciprocating Parts of Two Cylinder Locomotive-

Variation of Tractive Force, Swaying Couple Hammer blow, Coupled Parts of a Engine, Balancing of In-Line Engines, Two Cylinder and Four Cylinder In-Line Engines, Balancing of Higher Harmonies in High Speed Engines with Identical Reciprocating Parts, Balancing of V-Engines.

13. VIBRATIONS:

Introduction, Types of Vibration, free or Natural, Forced, Undamaged and Damped, Longitudinal, Tranverse and Torsional, Definitions, Periodic, Period, Cycle, Frequency, Degree of Freedom, Priciple Mode of Vibration, General Expression for Vibratory Motion Considering, Actuating Force, Free or Natural Undamped vibration, Free Damped Vibration (Viscous Damping), Forced Undamped Vibration, Forced Damped Vibration , Differential Equations Method, Forced Damped Vibration, vector Method, Vibration when Support is Flexible and Executes, Undamped, Damper Grounded and Damper Connected to Spring, Vibration Isolation, Multidegree Freedom System, Two Degree Freedom System, Undamped Vibration Absorber, Pendulum Absorber, Transverse, General Expression for Transverse Vibration Carrying Distributed Load, Frequency of Transverse Vibration of Simply Supported Shaft Carrying Uniformly Distributed Load, Frequency of Transverse Vibration Carrying Several Loads, Dunkerly Method, Energy or Raleigh's Method , Whirling of Shaft, Critical Speed, Torsional Vibration, Determination of Equivalent Inertia of Rotating and Reciprocating Parts of Engine, Reducing a Bent Crankshaft to an Equivalent Straight Shaft, Torsionally Equivalent Shaft, Torsional Vibration of Two Rotor System, Torsional Vibration of Three Rotar Systems when Diameter and Length of Various Portions of Shaft are Given, Torsinal Vibration of three Rotor System when Stiffness of Various Portions of Shaft Given, Analytical Method, Tabular Method for Torsinol Vibration of Geared System, Equating Strain Energy in Extreme Positions, Equating Kinetic Energy in Mean Position, Multiflar System, Biflar and Triflar Suspensions, Equivalent Spring System, Vibration Absorbers, Metallic and Organic Absorbers. Vibration Instrumentation, Amplitude, Frequency, Velocity and Acceleration Measuring Instruments.
