



**LEARNING RESOURCES**  
**In**  
**Mechanical Engineering**  
*Content List*

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**Kunal IT Services (P) Ltd.** is a Pune based Firm specializing in the Design, Development of the Education Contents for the Engineering Degree courses. We have developed CAI/ LRs in Mechanical Engineering for the subjects mentioned below, which are useful to both Teachers and Students.

### **Mechanical Engineering Learning Resources**

- Theory of Machine
- Machine Design
- Automobile Engineering
- Manufacturing Processes
- Refrigeration and Air Conditioning
- Metrology & Quality Control
- Thermal Engineering
- Tool Engineering
- Automobile Engine
- CNC Machines
- NDT- Non Destructive Testing
- Strength of Materials

## Chapter wise contents of LRs

### Strength of Materials

Chapter	Topic
<b>Ch:1 Stress and Strain</b>	Concept of Elastic, Plastic & Rigid Body, Types of load, Concept of Axial Load/Stress, Concept of Stress, Types of Stresses & Strain, Hooke's Law, Volumetric Strain, Definitions, Measurement of Ductility, Deformation of a Body due to self weight, Principle of Superposition, Modular Ratio, Stress and Strain in composite member, Stress and Strain in compound bars, Temperature Stresses and Strains, Shear Stress and Strain, Simple shear and complementary shear, Bars of varying Sections, Punching Shear
Highlights	<b>Learn through Animations:</b> Concept of Loads, Stresses, Strains. See how ductile material behaves under load. Principle of Superposition, Temperature stresses in composite bars.
<b>Ch:2 Elastic Constants</b>	Elastic Constants, Linear Strain, Lateral Strain, Poisson's Ratio, Concepts of Uni-axial Loading Volumetric Strain of a rectangular bar, Volumetric Strain of a circular bar, Concept of Bi-axial loading Concept of Tri-axial loading, Bulk Modulus, Relation between Bulk Modulus and Young's Modulus Shear Modulus and Modulus of Rigidity, Relation between Modulus of Elasticity and Modulus of Rigidity, Relation between three elastic constants E, G and K
Highlights	<b>Learn through Animations:</b> Concepts of Uni-axial loading. Concept of Bi-axial loading. Concept of Tri-axial loading
<b>Ch:3 Principal Planes and Stresses</b>	Different states of Stresses, Principal Planes and Stresses, Definitions Analytical Method for Stresses acting on an Inclined Plane, Graphical Method for Stresses on Oblique section, Mohr's circle method.
Highlights	<b>Learn through Animations:</b> How Normal and Shear Stresses acts on oblique section of a body subjected to pure shear. How to find stresses on oblique section using process of graphical method. Understand the Mohr's Circle Method.
<b>Ch:4 Strain Energy</b>	Strain Energy stored in a body due to gradually applied load, Impact Loading, Suddenly applied Load
Highlights	<b>Learn through Animations:</b> Gradually applied load, Impact Loading, Suddenly applied Load
<b>Ch:5 Moment of Inertia</b>	Centre of Gravity or Centroid of Lamina, Uniform Lamina, Centroid of a uniform lamina Centroid of a triangular lamina, Centroid of a Trapezium, Moment of Inertia of a Lamina, Parallel Axes Theorem, Perpendicular Axes Theorem, Moment of Inertia of a Lamina of different shapes, Moment of Inertia of composite sections.
Highlights	<b>Learn through Animations:</b> How to Calculate MI of Composite Section
<b>Ch:6 Shear Force and Bending</b>	Types of Beams, Concepts of Loads, Statically determinate Structure, Support reactions, Shear Force, Bending Moment, Concept of Shear Force and Bending Moment, Relation between Shear Force, Bending Moment and rate of loading,

<b>Moment</b>	Shear Force and Bending Moment Diagram.
Highlights	<b>Learn through Animations:</b> What is meant by udl, uvl. How to calculate support reactions for various types of beams. How to calculate SF and BM for various types of beams.
<b>Ch:7 Bending Stresses in Beams</b>	Concept of Pure Bending, Theory of Simple Bending, Assumptions in the simple theory of Bending Neutral Axis, Moment of Resistance, Section Modulus, Section Modulus for various shapes of Beam Sections.
Highlights	<b>Learn through Animations:</b> Simple Bending Concept of Moment of Resistance
<b>Ch:8 Shear Stresses in Beams</b>	Shear Stress Distribution for a Beam, Horizontal Shear Load per unit length of a beam at a section, at a certain level, Distribution of Shear Stress over a rectangular section, Distribution of Shear Stress over a triangular section, Distribution of Shear Stress over a circular section, Distribution of Shear over an I-section, Shearing Stresses in a channel section.
<b>Ch:9 Torsion</b>	Torsional Stresses and Strains, Solid Shaft, Hollow Shaft, Composite Shaft, Polar Moment of Inertia Power transmitted by a Shaft, Strain Energy due to Torsion, Combined Bending and Torsion Combined Bending and Torsion along with Axial Thrust, Shaft Couplings, Springs, Closely coiled Helical Spring subjected to an axial Load.

## Automobile Engineering

<b>Ch:1 Introduction of Automobile Engineering</b>	The Basic Structure, Frame, Suspension System, Axles, Wheels, The Transmission System, Clutch
<b>Ch:2 The Chassis Construction</b>	The Chassis Construction, Conventional Construction, Functions of the frame, Loads on the frame Frame Construction, Materials for frame
<b>Ch:3 Clutches</b>	Requirements of Clutch, Principle of Friction Clutches, Types of Clutches , Single Plate Clutch, Multiple Clutch, Centrifugal Clutch, Electromagnetic Clutch, Hydraulic Single Plate Clutch
<b>Ch:4 Transmissions</b>	Functions of Transmission, Necessity of Transmission, Sliding Mesh type of Gear Box, Constant, Mesh Gear Box, Synchromesh Gear Box
<b>Ch:5 Propeller Shaft and Rear Axle</b>	Propeller Shaft and Rear Axle Propeller Shaft, Differential, Rear Axle, Rear Axle Drives
<b>Ch:6 Suspension System</b>	Basic Considerations, Leaf springs, Coil springs, Torsion Bars, Tapered Leaf, Springs, Rubber springs, Compression shear spring, Torsional shear spring Anti-roll device
<b>Ch:7 Front Axle and Steering</b>	Introduction, Front axle, Steering Geometry, Steering Axis Inclination, Toe-in or Toe-out, Under steer and over steer, Steering Linkages, Ackermann, Mechanism, Worm and wheel steering gear
<b>Ch:8 Brakes</b>	Introduction, Mechanical Brakes, Parking and Emergency Brake, Hydraulic, Brakes, Air Brakes, Vacuum Brakes, Electric Brakes, Hand Brakes, Brake Lining Maintenance of Brakes
<b>Ch:10 Engine Principle and Fundamentals</b>	Classification of engines, Otto or Constant Volume Cycle, Diesel Cycle, Dual Combustion or Mix or Limited Pressure Cycle, Use of Engines, Four Stroke SI Engine, Valve Timing Diagram of Four Stroke Petrol Engine, Actual valve timing diagram, Four Stroke CI Engine, Actual Valve Timing diagram of Four Stroke CI Engine, Two stroke cycle, SI engine
<b>Ch:11 Construction Features</b>	Construction Features of Automobile Engine Components, Cylinder block, Cylinder liner, Cylinder Head, Gaskets, Piston, The main functions of piston Piston Rings, Piston Pin or Gudgeon Pin, Connecting rod, Crankshaft, Mounting of Crank Shaft, Engines Valves, Valve Cooling, Valve Actuating ,Mechanisms, Mechanisms with overhead camshaft, Comparison of the side camshaft and the overhead camshaft mechanisms, Type of camshaft drive Manifolds, Silencer, Flywheel
<b>Ch:12 Engine Cooling System</b>	Engine Cooling System, Methods of Cooling, Thermosyphon System, Pump Circulation System, Comparison of air and water cooling system, Components of water cooling system, Radiator, Pressure cap and expansion reservoir, Thermostat, Bi-metallic thermostat, Bellows type thermostat, Water Pump Water jacket, Cooling Water Additions, Cooling system Trouble Shooting
<b>Ch:13 Lubrication Systems</b>	Purpose of Lubrication, Liquid, Functions of Lubricating Oil, Properties of lubricating oil, Petrol System, Splash System, Pressure system, Dry sump system, Crankcase Ventilation, Ignition Limits
<b>Ch:14 Fuel Systems</b>	Fuel feed system in petrol engines, Mechanical fuel pump, Electrical fuel pump Principles of Carburetion, Simple carburetor, Main metering system, Back-suction control or pressure reduction method: Idling system, Power Enrichment or Economizer system, Acceleration pump system, Solex

	Carburetor, Cold starting and warming, Requirement of fuel injection system, Various components of diesel injection system, Fuel Filter, Fuel injection pump Fuel injector, Types of fuel injectors, Mechanically Operated Fuel Injector Distributor type Fuel injection pump
<b>Ch:15 Ignition Systems</b>	Need of ignition system, Battery ignition system, Components of the ignition system, Ignition Coil, Ballast Resistor, Contact breaker, Condenser, Distributor Spark plug, Spark plug heat range, Spark plug detects, Magneto - Ignition system, Ignition timing

## Automobile Engines

<b>Ch:1 Air Pollution and Emission Control</b>	Pollutants from Gasoline Engines, Evaporative Losses, The mechanism of tank loss is as follows, Exhaust Emissions, Carbon Monoxide (CO) Hydrocarbons, Particulate matter and partial oxidation product Oxides of Nitrogen, Diesel Smoke and Control, Causes of smoke, Diesel Odour an Control, Mechanism of odour production, Factors affecting odour production
<b>Ch:2 Calculation of Engine Power and it's Performance</b>	Torque, Indicated Horse Power (I.H.P.);, Brake Horse Power (B.H.P.);, Brake Horse Power and Car Speed, Friction Horse Power (F.H.P.), Engine Efficiencies, Thermal efficiency, Scavenge Efficiency, Performance Curves Heat carried away by exhaust gases, Air Standard Efficiency of Otto Cycle Characteristics of Otto Cycle, Air Standard Efficiency of Diesel Cycle Absorption Dynamometers, Prony Brake, Rope Brake, Hydraulic, Dynamometer, Eddy current dynamometer, Swinging field d.c., Dynamometer , Fan Dynamometer, Measurement of friction power Willan's line method channel rate extrapolation, Morse Test, Motoring Test Difference between i.p. and b.p., Measurement of Indicated power Requirements of accuracy in measuring i.p., Piston indicator , Factor Affecting Combustion in a Dual-fuel Engine, Injection Timing
<b>Ch:3 Fuel</b>	Basic Terms, Petrol (Gasoline) and Properties, Fuels for Spare-Ignition Engine, Volatility of Liquid Fuels, ASTM Distillation Test , Reid Vapour Pressure, Equilibrium Air Distillation, Effect of Volatility Engine, Performance, Front End Volatility
<b>Ch:4 LPG Conversion System</b>	Description of Petrol - LPG System, Auto LPG Tank, Multivalve, Vapour Box, LPG Copper Tube, Re-filling valve, LPG Solenoid (LPG lock off valve): Pressure Reducer, Change Over Switch, Filling LPG Tank, Operating Instructions - Carburetor Vehicles, Trouble Shooting, Vehicle Components CNG Auto gas Systems
<b>Ch:5 Scavenging</b>	Theoretical Scavenging Processes, Perfect Scavenging, Perfect Mixing Short-Circuiting, Scavenging Parameters, Measurement of Scavenging Efficiency, Scavenging Systems, Comparison of Different Scavenging Systems, Scavenging Pumps
<b>Ch:6 Supercharging</b>	Objects of Supercharging, Supercharging of Spark-Ignition Engines Supercharging of CI Engines, Effect of Supercharging on Performance of the Engine, Fuel Consumption, Supercharging Limits of SI Engines, Supercharging Limits of CI Engines, Modification of an Engine for Supercharging, Methods of Supercharging, Superchargers, Reciprocating Compressor, Vane Blower, Lysholm Compressor, Roots Blower, Centrifugal Compressor, Turbochargers
<b>Ch:7 Theory of Combustion</b>	Ignition Limits, Stages of Combustion in SI Engine, Effect of Engine Variables on Ignition Lag, Fuel, Mixture ratio, Detonation or Knocking Combustion in the CI Engine, Stage of Combustion, Air-fuel ratio in CI Engine, Delay Period or Ignition Lag, Variables Affecting delay PeriodDiesel Knock, Diesel Knock, Method of Controlling Diesel Knock, The CI engine Combustion Chambers, Methods of Generating air swirl in the CI engine Induction Swirl and open combustion chambers

## Machine Design

<b>Ch:1 Fundamental</b>	Classification of Machine Design, Basic design requirement General Design Procedure, Mechanical Properties of Material, Selection of Factor of safety, Fitgue and Endurance Limits
<b>Ch:2 Stress Analysis</b>	Loads, Tensile stress, Shear stress, Bending stress, Torsional stress, Compressive stress, Deign of liver Design of Cotter Joints, Soket and spigot Cotter Joint
<b>Ch:3 Design of machine parts subjected combining loading</b>	Application of principle stresses in Designing Machine member, Design of hand Lever, Design of Bell Crank
<b>Ch:4 Design of shaft, keys and coupling</b>	Types of key, Sunk Key, Rectangular key, Square sunk key Parallel sunk Key, Gib headed key, Feather key, Wood roof key, Saddle key, Shaft and couplings & its application Rigid coupling, Flexible Coupling, Design Procedure of Muff coupling, Bush pin flexible coupling
<b>Ch:5 Design of power screw</b>	Types of screw threads used in power screw, Square Thread, Acme Thread Butters Thread, Design of Screw jack
<b>Ch:6 Design spring</b>	Spring function and its application, Helical spring, Conical volute spring Torsion spring, Leaf Spring, Disc spring, Special purpose spring, Material For helical spring, Design of helical tension and compression spring Design of Simple leaf spring
<b>Ch:7 Design of screw and welded joints</b>	Types of screw and fastening, Advantages & Disadvantages of screw joints Stresses in screwed fastening, Bolts of uniform strength, Design of Design of bolt for cylinder cover, Design of cylinder flange, Eccentric load acting parallel/perpendicular to the axis of the loads, Welded joints, Strength of transverse fillet welded joints
<b>Ch:8 Design of Bearing</b>	Types of bearing, Journal Bearing, Foot step or Pivot Bearing, Coller bearings, Types of gear, Design Consideration for a gear drive Beam Strength of gear teeth lewis equation, Design Procedure for spur gear

## Manufacturing Processes

<b>Ch:1 Patterns</b>	Introduction, Pattern material, Types of patterns single piece or solid patterns, Split pattern, Match plate pattern Loose piece pattern, Sweep pattern, Core box, Half box Dump box, Split Box, Gange box
<b>Ch:2 Molding and Casting</b>	Casting Process, Sand casting, Types of moulds, Types of moulding process, Moulding procedure for disposable pattern, Ingredients of moulding sands, Classification of sands, Mechanical moulding, Types of moulding machine Jolt machine, Squeezer machine, Sand slinger, shell moulding
<b>Ch:3 Hot and cold Working Process, Forging</b>	Hot working process, Hot rolling, Forging, Hand forging drop forging, Press Forging, Cold working Processes Cold forging, cold rolling, Extrusion, Direct extrusion Indirect extrusion, Cold extrusion, Principle of wire drawing, Rotary swaging, Coining and Hobbing
<b>Ch:4 welding process</b>	Welding Process, Soldering Brazing, Fluxes, Gas welding Arc welding, Metal Arc welding, TIG welding, MIG welding, Oxyacetylen torch cutting machine
<b>Ch:5 Press and Press work</b>	Fundamental, Press operation, Types of machine, Fly Press, Power press, Classification of press based on the types of designs of frame, Inclinable frame press Pillar type press, Classification of Dies, Compound dies Combination Dies, Progressive Dies, Die Set Specification
<b>Ch:6 Fundamental machining process</b>	Basic Concept of machine tool, Cutting Shapping process, Types of cutting tool, Single point cutting tool, Multipoint cutting tool, Tool material, Cutting fluid, Chip formation, Orthogonal And oblique cutting Importance of tool angle, Single point cutting tool geometry
<b>Ch:7 Lathe Machine</b>	Basic components of lathe, Method of holding a work piece on lathe Lathe Centers, face plate, Chucks, Operation on lathe machine
<b>Ch:8 Drilling Machine</b>	Types of drilling machine, Twist Drill and terms, Drilling operations, Reaming, Counter sinking, Counter boring, Spot facing
<b>Ch:9 Boring and broching Machine</b>	Types of Boring machine, Horizontal Boring machine, Table type Horizontal Boring Machine, Broching machine, Horizontal/vertical broching machine, Broching tool, Types of broches
<b>Ch:10 Grinding Machine</b>	Bench Grinding Machine, Center type Grinding machine, Plain center type Grinder, Centerless Grinder, Internal Grinders, Surface Grinding machine, Tool and cutter Grinder

## Metrology & Quality Control

<b>Ch:1 Metrology</b>	Metrology is a science of measurements, Scope Of Metrology, Need of Inspection, Interchangeability, Error and Sources of Errors, Elastic Deformation, Contact Pressure
<b>Ch:2 Measurement</b>	Principles of measurements, Standards of Measurements, Linear Measurement concept, Vernier Caliper, Construction and Working, Micro-Meter, Construction and Working, Slip Gauge, Surface Plate, Angle Plate, Vernier Height Gauge, Liquid surface gauge Method, Spirit Level, Vernier Depth Gauge
<b>Ch:3 Limit Fits And Gauges</b>	Concept of Limits, Fits And Tolerances, GO & NOGO Gauges – Taylors Principle, Plug Gauge, IS 919 – 1963 SYSTEM, Grades of Tolerances Limit Systems, ISO System of Limits and Fits., Calculation of Tolerance Grades
<b>Ch:4 Angular Measurements</b>	Sine Bar, Angle measurement of small size component, Angle measurement when component size is large, Bevel Protractor, Angle Gauges, Clinometer Auto-collimator, Optical Square, angle Dekkor is used to measure angle of a taper plug gauge
<b>Ch:5 Screw Thread Measurements</b>	Nomenclature of Parallel Threads, Method of Checking measure diameter of an external straight thread, Measurement of the minor diameter of a "V" screw thread: , Maker's Microscope, Thread micrometer method, Optical Projector, Construction and working of a pitch-measuring machine
<b>Ch:6 Comparators</b>	Classification, Characteristics of Comparator, Mechanical comparators, Electrical comparators, Optical comparators, Pneumatic comparators Advantages and Disadvantages of Mechanical Comparators, Sigma Comparator, Construction and Working of Solex Pneumatic Comparator
<b>Ch:7 Surface Finish Measurement</b>	Surface Texture, Measurement of Surface Texture, Roughness comparison specimen, Symbols Used To Indicate Direction of lay, Sampling length Description of Ra and Rz Value. Ra value, Surface Roughness Representation R.M.S. Value, CLA Value, Surface finish of a machined surface
<b>Ch:8 Testing Techniques</b>	Straightness, Straight edge method, Beam Comparator method Parallelism of two axes, Testing of Squareness of an axis of an rotation with a given plane, Alignment tests of pillar type drill machine, Perpendicularity of drill head guide with the base plate, Optical flats, Finish measurement of micrometer anvil surfaces, Surface concavity and convexity are checked by optical flat and monochromatic light

## Refrigeration & Air Conditioning

<b>Ch:1 Principle of Refrigeration</b>	Introduction, Reverse Carnot cycle, Engine Refrigerator and heat pump, Refrigerating effect and unit of refrigeration
<b>Ch:2 System of Refrigeration</b>	Various system of refrigeration, Application of refrigeration Refrigeration using ice, Stem jet Refrigeration, Vapour compression refrigeration cycle, Refrigerant vapour absorption system, Liquid vapour heat exchanger, Electrolux refrigerator Domestic Refrigerator, Refrigerant storing cylinder
<b>Ch:3 Fundamentals of Air-conditioning Systems</b>	Introduction, Air Conditioning Unit, Elements of Air-conditioning Systems
<b>Ch:4 Psychrometric</b>	Psychrometric terms, Psychrometers, Adiabatic Saturation of Air, Psychrometric Chart, Psychrometric Processes, Sensible heating and sensible cooling process, Cooling with dehumidification, Cooling with adiabatic humidification Adiabatic chemical dehumidification, Heating and Humidification, Sensible Heat Factor (SHF); Grand Sensible Heat Factor (GSHF) , Cooling Load Calculations
<b>Ch:5 Air-conditioning Systems Applications</b>	Classification of Air-conditioning Systems, Summer Air-conditioning Systems, Winter Air Conditioning System Central Air-conditioning System, Unit Air Conditioners Packaged Air Conditioners, Residential Central System Air Conditioning Applications, Special application of air-conditioning

## Thermal Engineering

<b>Ch:1 Sources of Energies</b>	Sources of Energies, Thermal Power Plant, Conventional Sources of Energy, Thermal Power Plant, Hydroelectric Power Plant, Nuclear Source of Energy, Solar Energy, Solar Energy Collectors, Applications of Solar Energy, Wind Energy, Sub-components of the windmill, Advantages of wind energy conversion system, Disadvantages of wind energy, Tidal Energy, Components of Tidal Power Plants:, Advantages of Tidal Power Generation, Geothermal Energy, Applications of Geothermal energy, Biogas Plant, Working of Biogas plant
<b>Ch:2 Fundamental Concepts &amp; Laws of Thermodynamics</b>	Basic concept of working substance, Types of system, Properties of a system, State of a system, Absolute, Gauge and Vacuum Pressure, Relationship between pressures Mathematically Enthalpy, Entropy, Energy, Law of conservation of energy Heat, Work, Sign convention for work, Law of thermodynamics Zeroth law of thermodynamics, First law of thermodynamics Second law of thermodynamics, Kelvin-plank statement Clausius Statement, Equivalence of Kelvin-plank & Clausius statements, Flow Processes, Steady flow energy equations
<b>Ch:3 Steam and Steam Boiler</b>	Concept of a Steam, The process of formation of steam, Terms for Steam, Enthalpy or total heat of Steam, Properties of Steam Classification of steam boiler, Selecting of steam boilers, Essentials of a good steam boiler, Mountings, Cochran boiler or Vertical multi tubular boiler, The specifications of Cochran Boiler Locomotive boiler, The specifications of the locomotive boilers Babcock and Wilcox water tube boiler, Lamont Boiler, Loeffler boiler, Velox boiler, Boiler mountings
<b>Ch:4 Steam Turbines &amp; Steam Condensers</b>	Types of stem nozzels, Applications of nozzles, Steam turbine Pressure and Velocity of steam in an impulse turbine, Components of Parsons reaction turbine, Internal Loses in turbines, Regenerating feed heating and bleeding of turbine Steam turbine governing and control, Steam condenser Elements of steam condensing plant, Effect of air leakage in condenser, Condenser efficiency, Cooling towers , Classifications of cooling towers, Droughts
<b>Ch:5 Gas Turbines</b>	Classification of gas turbines, Comparison of closed cycle & open cycle gas turbines, Requirements of a combustion chamber for gas turbine are, Application of Gas turbines, Jet Propulsion, Types of Jet engines, Turboprop Engine, Ramjet engine, Rocket Engines
<b>Ch:6 Air Compressor</b>	Introduction-Air compressor, Single stage single acting air compressor, Technical terms, Mean effective pressure Multistage compressors, (P-V) diagram - multistage compression, (T-S) diagram - multistage
<b>Ch:7 Power Generation System</b>	Thermal power plant, Coal & ash circuits, Steam power plants Elements of steam power plants, Water softening plants Gas turbine power plant, Nuclear power plant, Elements of nuclear power plants, Main parts of a Nuclear reactor, Classification of Nuclear reactors, Types of Nuclear reactors Advantages of Nuclear power plants, Nuclear waste disposal

## Theory of Machine

<b>Ch:1 Fundamentals</b>	Definitions of Static's, Dynamics, Kinematics and Kinetics, Kinematic pairs and their types, Four bar kinematic chain mechanism, Constrained motions and types of constrained motion, Mechanisms, Inversion of a mechanism
<b>Ch:2 Types of Mechanisms</b>	Laws of Inversions, Crank and slotted lever type mechanism or quick return mechanism, Rotary Engine Mechanism, Hand Pump, Inversions of Four bar Chain, Coupled wheels of Locomotive , Walt Straight line mechanism Pantograph, Double slider Crank Chain, Inversion of double slider crank chain
<b>Ch:3 Velocity and Acceleration in Mechanisms</b>	Linear Displacement, Velocity, Acceleration, Concept of relative velocity Velocity diagram of a rigid link, Instantaneous Center, Acceleration diagram of a Link by relative velocity method, Klein's construction for velocity and acceleration diagram
<b>Ch:4 Cams &amp; Followers</b>	Classifications of followers, Classification of cams, Terminology and definition of Cam, Different follower motions, Motion with uniform acceleration ad retardation of cam
<b>Ch:5 Power Transmission Devices</b>	Types of Belts, Ropes, Open belt drive , Crossed belt drive, Slip and Creep of belt, Determination of ratio of tensions in Belt Drive, Advantages of Fibre rope drives, Wire ropes , Chain drives, Advantages and disadvantages of chain drive over belt and rope drive:, Gear & Gear Trains, Gear Terminology Types of Gears, Gear Trains, Simple Gear train, Compound Gear train Reverted Gear Train, Epicyclical Gear Trains
<b>Ch:6 Flywheels and Governors</b>	Piston Effort, Turning moment diagram, Net turning moment diagram Turning moment diagram for multi cylinder engine, Coefficient of fluctuation of energy, Energy Stored in a flywheel, Types of Governors, Simple Governor (Centrifugal / Walt), Portor Governor & Proell Governor, Spring Loaded governor, Wilson Hartnell Governor, Pickering Governor, Inertia Governor
<b>Ch:7 Brakes and Dynamometers</b>	Types Of Brakes, Simple block brake or shoe brake, Band Brake , Band & Block brake, Internal Expanding Shoe Brake, Hydraulic Brakes, Vacuum Brakes Dynamometer, Absorption Dynamometers, Transmission Dynamometer, Hydraulic Dynamometer, Classification Of Transmission Dynamometer
<b>Ch:8 Friction and Clutches</b>	Types of Friction, Laws of Solid friction or dry friction, Flat Pivot Bearing Considering uniform wear, Conical Pivot bearing, Trapezoidal or Truncated conical pivot bearing, Single Disc or Single Plate Clutch, Multiple Disc Clutch Centrifugal Clutch

## Tool Engineering

<b>Ch:1 Machining process</b>	Classification of machining process, Types Cutting of Tools, Cutting Fluids Single point cutting tool, Importance of Tool Angles, Tool Nomenclature System American System (ASA System), British System, Continental System, International System
<b>Ch:2 Tool Material</b>	Properties of Tool Material, Types of Tool Material, Alloyed Tungsten Carbide Grade, Ceramic Tool Materials, Diamond Tool
<b>Ch:3 Mechanics of Tool Cutting</b>	Shear Plane, Cutting ratio, Shear Angle, Chip Velocity and Velocity shear force relations, Orthogonal And Oblique Cutting Processes, Co-efficient of friction Temperatures in metal cutting tool, Factors affecting the cutting tool
<b>Ch:4 Tool Performance</b>	Factors affecting tool life, Process Variables, Tool Geometry, Tool Material Tool Wear and factor affecting Tool Wear causes and Types of Tool failure Factors affecting Tool wear, Machinability
<b>Ch:5 Jig's And Fixtures</b>	Main Elements of Jig's and Fixtures, Difference between Jig and Fixture Principle of Location, Locating Devices and Methods, Principles of clamping purposes, Design Principles for Indexing, Milling Fixtures, Boring Fixture Lathe Fixture, Tool Proofing, Standards Used in Jigs and Fixtures
<b>Ch:6 Press Tools</b>	Fundamentals, Types of Press operations, Types Of Press Machines, Fly press or ball press, Cutting dies, Forming dies, The multi-operation dies, Die Sets Die set specifications
<b>Ch:7 Blanking And Piercing Die</b>	Shear Cutting Theory, Clearance specification, Scrap strip Layout , Center of pressure, Types of Die, Progressive Die, Compound Die, Inverted Die
<b>Ch:8 Drawing Dies</b>	Type of Drawing Dies, Classification of Drawing Dies, Knockout pin classification, Functions of Pressure Pad, Types of bending dies, Construction of Dies, Methods of Die support

**NDT-Non-Destructive Testing**

<b>Ch:1</b> <b>Introduction</b>	Introduction to NDT
<b>Ch:2</b> <b>Penetrant Testing</b>	Basic Principal, Theory , Procedure, Advantages Limitations, Specifications & Standards
<b>Ch:3</b> <b>Magnetic Particle Testing</b>	Basic Principal, Theory , Procedure, Advantages Limitations, Specifications & Standards
<b>Ch:4</b> <b>Ultrasonic Testing</b>	Basic Principal, Theory, Procedure, Advantages Limitations, Specifications & Standards
<b>Ch:5</b> <b>Radiographic Testing</b>	Basic Principal, Theory , Procedure, Advantages Limitations, Specifications & Standards
<b>Ch:6</b> <b>Visual Testing</b>	Definition, Test for Eye, Tools Used, Specifications & Standards