



**LEARNING RESOURCES**  
**In**  
**Civil Engineering**  
*Content List*

Kunal IT Services Pvt. Ltd.  
925/A, Trikaya House, Deendayal Hospital Lane  
F.C. Road, Pune-411005  
Maharashtra, India

**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 Civil Engineering for the subjects mentioned below, which are useful to both Teachers and Students.

### Civil Engineering Learning Resources

- Strength of Material
- Transportation Engg (with road/railway/tunnel/airport/docks)
- Surveying
- Civil Engineering Planning & Designing & Drawing
- Construction Management
- Irrigation Engineering
- Environmental Engineering
- Building Construction
- Building Materials
- Concrete Technology
- Soil Mechanics
- Theory of Structure
- Repairs & Maintenance
- Hydraulics Engineering
- Advanced Construction Technology
- Design of Structure
- Estimation & Costing
- Building Services
- NDT- Non Destructive Testing
- GIS

### Technically Complete Content

Subject	Theory Pages	Figures	Animations	Video Clips	Software Modules
Transportation Engg	√	√	√	√	√
Surveying	√	√	√	√	√
Design and Detailing of RCC, Steel Structures	√	√	√	√	√
Concrete Technology	√	√	√	√	√
Soil Mechanics	√	√	√	√	√
Hydraulics	√	√	√	√	√
Environment Engineering	√	√	√	√	√
Irrigation Engineering	√	√	√	√	√
Building Construction	√	√	√	√	√
Building Materials	√	√		√	
Civil Engg Planning and Design, Drawing	√	√	√	√	√
Strength of Materials	√	√	√	√	√
Construction Management	√	√	√	√	√
Advanced Construction Technology	√	√	√		
Repairs & Maintenance	√	√	√		
Estimation & Costing	√	√	√	√	√
Theory of Structures	√	√	√	√	√

The Software Modules are helpful in solving the numericals on various topics in the subjects. This increases efficiency of the teacher as well as of the student.

### Details of Subject wise Contents

## 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 Moment</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, 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</b>	Concept of Pure Bending, Theory of Simple Bending, Assumptions in the simple theory of Bending

<b>in Beams</b>	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.



## Transportation Engineering

<b>Ch:1 Road Engineering</b>	Advantages of Road Transportation system, Comparison Between Roads & Rail way Important Organization, Department of Road Transport & Highways, Classification of Roads, Surveys for locating Proposed Road, Fixing the Road Alignment, Factor controlling the Road Alignment, Hill Roads, Traffic Engineering
<b>Ch:2 Geometric Design of Roads</b>	Importance of Geometric Design, Design Controls And Criteria, Sight Distance, Design of Horizontal Alignments, Design of Vertical Alignment
<b>Ch:3 Road Material &amp; Construction</b>	Road Materials (California Bearing Ratio Method), Road Construction, Drainage of Road
<b>Ch:4 Types of Bridges and Components</b>	Classification of Bridge, Selection of Bridge Site, Bridge Superstructure, Types of Bridge, Component Part of Bridge, Inspection & Maintenance
<b>Ch:5 Components Parts of Railway</b>	Railway Track, Rails, Sleepers, Ballast, Joints & Welding of Rails, Fixtures & Fasteners, Points & Crossing.
<b>Ch:6 Geometric Design of Railway</b>	Track Alignment, Creeps of Rails, Track Laying & Maintenance,
<b>Ch:7 Station &amp; Yards</b>	Railway Station, Station Yards, Equipment in Station Yard, Equipment in Station Yard,
<b>Ch:8 Tunneling</b>	Classification of Tunnels, Shapes of Tunnel, Factor Affecting Shapes of Tunnel, Selection of Route & Tunnel, Geological Investigation, Advantages of Tunnels, Economics of Tunnels
<b>Ch:9 Construction of Tunnels</b>	Driving Tunnel in Soft Ground, Driving Tunnel in Rock, Lining & Grouting, Drainages
<b>Ch:10 Docks And Harbor</b>	Classification of Harbor, Site Selection of Harbor, Elements of Harbor
<b>Ch:11 Airport Planning &amp; Layout</b>	FAA Recommendation, Development of New Airports, Site Selection for Airport, Survey for Site selection, Terminal Area & Airport Layout, Taxiway Design, Visual Aids, Heliports, Airport Pavement.

## Survey – I

<b>Ch:1 Chaining and Cross Staff Surveying</b>	Principle of Chain Surveying, Technical Terms Used, Selection of Survey Station, Selection of Base Line, Offsets, Locating Building Corners & Point of Intersection Error due to Interconnect Ranging, Combined Error in Length and Direction, Field Book, Recording the Field Book, Field Work for chain Survey, Instruments for Setting out Right Angles, Field Problems and Their Solutions, Obstacles in Changing, Cross Staff Survey.
<b>Ch:2 Chain and Compass Survey</b>	Types of Traverse (Depending upon end points), Types of Traverse (Instrument Used), Dip of Magnetic Needle, Compass, Temporary Adjustments of Compass, Permanent Adjustments of Compass, Meridians and Bearings, Types of Meridians, Designation of Bearing, Fore Bearing and Back Bearing, Included Angles From Bearings, Bearings From Included Angles, Local Attraction, Declination, Traversing With Chain and Compass, Plotting of Traverse, Closing Error Adjustment, Errors in Compass Surveying, Precautions in Compass Surveying.
<b>Ch:3 Leveling</b>	Principle of Leveling, Important Definitions, Instruments for Leveling, Compare Between Self Reading & Target Staff, Temporary Adjustments of Dumpy Level, Bench Mark, Leveling, Reduction of Levels, Compare Between Plane of Collimation & Rise and Fall Method, Classification of Leveling, Difficulties in Leveling, Errors in Leveling Sensitiveness of Level Tube, Measurement of Sensitiveness, Principle of Reversal Fundamental Lines of Level, Permanent Adjustment of Level, Methods of Adjustment Barometric Leveling.
<b>Ch:4 Contouring</b>	Representation of Relative Heights, Concept of Contour and Contour Interval Characteristics of Contour, Contour of Natural Features, Methods of Contouring Interpolation of Contour, Contour Gradient, Uses of Contour Map
<b>Ch:5 Plane Table Surveying</b>	Instruments for Measurements, Setting up the Plane Table, Sighting the Ground Station Technical Terms, Methods of Plane Table Survey, Advantages and Disadvantages Errors in Plane Tabling
<b>Ch:6 Angular Measurement</b>	Parts of Transit Theodolite, Telescope, Technical Terms Used, Fundamental Lines and Geometry of Transit, Temporary Adjustments of Theodolite, Permanent Adjustments of Theodolite, Uses of Theodolite, Precautions in Handling Theodolite, Errors in Theodolite Work, Theodolite Traverse
<b>Ch:7 Tachometry</b>	Instruments Used, System of Tacheometry, Principle of Stadia Method, Determination of Tacheometric Constants, Anallatic Lens, Fixed Hair System, Reduction of Stadia Observations, Field Work of Tacheometric Survey, Errors in Stadia Surveying
<b>Ch:8 Measurement of Area on Drawing Planimeter</b>	Determination of area, Area Between Straight Line and Irregular Boundary, Simpson's Rule and Trapezoidal Rule, Planimeter, Area of Zero Circle, Methods of Finding Area of Zero Circle, Precautions For Using Planimeter, Practical Method of Using, Planimeter.
<b>Ch:9 Simple Curves</b>	Curves and Its Types, Elements of Curve, Relation Between Degree of curve and Its Radius, Peg Interval, Location of Tangent Point, Methods of Setting Curves, Setting Out Curves (Offset From Long Chord), Setting Out Curves (Rankine's Method), Transition curve, Vertical curve

## Survey – II

<b>Ch:1 Geodetic Surveying</b>	Triangulation, Classification of Triangulation System, Steps For Triangulation, Reconnaissance, Selection Of Station, Intervisibility and Height Of Stations, Tower and Signals, Phase of Signal, Satellite Stations, Reduction to Mean Sea Level, Extension Of Base Line
<b>Ch:2 Triangulation Adjustments</b>	Laws Of Weights, Kinds of Errors, Most Probable Value And Its Methods Of Determination, Method Of Least Squares, The Problem Error And Its Determination, Station Adjustment, Figure Adjustment, Spherical Access Computation of Side Of Spherical Triangle.
<b>Ch:3 Trigonometric Leveling</b>	Correction For Curvature And Refraction, Axis Signal Correction, Determination Of Difference In Elevation.
<b>Ch:4 Ariel Photogrammetry</b>	Application Of Ariel Photogrammetry, Types Of Photographs, Ariel Camera, Flight Planning, Scale Of Vertical Photograph, Application Of Air Photography, Interval Between Exposure, Ground Control, Radial Line Method, Stereoscope, Parallax Equation, Stereo meter, Mosaic, Photo Interpretation, Computation Of Height From Photography.
<b>Ch:4 Remote Sensing</b>	Electromagnetic Spectrum, Remote Sensing Methods, Classification Of Remote Sensing Systems, Application Of Remote Sensing, Satellite Remote Sensing, Global Positioning System And Its Segments.
<b>Ch:5 Hydrographic Surveying</b>	Objects Of Hydrographic Surveying, Establishing Controls, Shore Line Survey, Sounding And Sounding Equipments, Methods Of Locating Sounding.
<b>Ch:6 Modern Surveying Equipments</b>	Geodimeter, Tellurometer, Tunnel Alignment Lasers, Electromagnetic Distance Meter (E.D.M.), Distomat, Total Station



**Civil Engg. Planning, Designing & Drawing**

<b>Ch:1 Introduction</b>	General Principles, Comfortable Conditions in Humid Topics, Comfortable Conditions in Dry Topics, Orientation of Building, Protection of Walls from Sun & Rain, Walls & Opening For Building, Chajjas and Sun Breakers, Temperature Transfer & Comfort Conditions, Air Gap for Comfort Conditions Ground Treatment with Vegetation.
<b>Ch:2 Principles of Planning</b>	Aspect, Prospect, Furniture requirements, Roominess, Grouping, Circulation Privacy, Sanitation, Sanitary Conveniences, Elegance, Economy, Orientation.
<b>Ch:3 Rules &amp; Regulations</b>	Regulations Regarding Layouts, Building Regulations, Rules For Special Types of Building, Calculation of Plinth, Floor & Carpet Area.
<b>Ch:4 Methods of Drawing</b>	Types of Drawing, Orthographic Drawing, Perspective Drawing

## Construction Management

<b>Ch:1 Construction Industry</b>	Role of Construction Industry, Development of Construction Industry, Various Small Scale Industries, Various Agencies, Types of Concreting Firms
<b>Ch:2 Features of Construction Industry</b>	Characteristics of Civil Engineering Works, Classification of Construction Works, Stages of Planning, Construction Stages
<b>Ch:3 Scientific Management</b>	Management, Necessity of Scientific Management, Functions of Management, Principles of Scientific Management
<b>Ch:4 Management of Civil Engineering Work</b>	Task Management, Management of Resources, Applications of Principles of Management, Function of Management, Function of Site Engineer
<b>Ch:5 Planning of Construction Activities</b>	Necessity & Importance of Planning, Pre-tender Planning, Post-tender Planning, Planning by Owners side, Planning by Contractors Side
<b>Ch:6 Organisation and organising Resources</b>	Organisation & Its Principles and Need, Organizing Resources, Personal Management & Its Functions, Types of Labour at Site Material Management & Its Functions, Inventory, Economical Order ABC Technique, Duties of Store keeper at Site, Safety of Stores, Records Pertaining to Stores, Types of Construction Equipment Selection of Equipment.
<b>Ch:7 Leadership and Human Relations</b>	Leadership & Its Functions, Qualities of Leadership, Human Relations Human Needs by Maslows Need Hierarchy, Motivation & its Importance Methods & Types of Motivation, Herzbergs Model
<b>Ch:8 Communication at site</b>	Importance of Communication at Site, Types of Communication, Barriers to effective Communication
<b>Ch:9 Supervision and Quality Control</b>	Concept of Quality, Principles of Inspection, Supervision And Inspection Techniques, Sampling Technique for Testing of Material, Quality Control Programmes
<b>Ch:10 Scheduling and Monitoring Process</b>	Scheduling & Its Advantages, Methods of Scheduling, Scheduling by Bar Chart, Limitation of Bar chart, Scheduling by CPM & Its Procedure Properties of CPM, Advantages of CPM, PERT & Its Advantages Resource Allocation.
<b>Ch:11 Budgeting and costing at site at Engineer's level</b>	Direct & Indirect Cost, Over Head Cost, Budget Allotment & Its Functions Cost Control, Stages, Maintaining Record, Work Order Book, Muster Roll Measurement Book, Cash Book, Budget at Site Engineers level
<b>Ch:12 Safety in Civil Engineering</b>	Importance of Safety in Construction Work, Accident Cost, Common Cause of Accidents in Site, Safety Measures & Precautions, Safety Programme.
<b>Ch:13 Work study and Productivity</b>	Concept of Productivity, Work Study, Method Study, Time Study

## Irrigation Engineering

<b>Ch:1 Introduction</b>	Introduction and Importance of Irrigation, History of development of Irrigation in India, Scenario of development of irrigation in the states during plan development, Types of Irrigation, Classification of Irrigation Works.
<b>Ch:2 National Water Policy</b>	Need for National Policy, National Water Policy, Clauses in the National Water Policy, Maharashtra Water Policy, Water Conservation Systems.
<b>Ch:3 Surveys</b>	Field Investigations, Preliminary and Detailed Engineering Surveys, Project Report
<b>Ch:4 Hydrology</b>	Hydrology, Types of Rain gauges, Factors affecting Run Off Inglis's Formula, Strange Table & Curves Binnie's Percentage table, Estimation of Maximum Flood Discharge, Estimation of maximum flood discharge by Ryve's formulae.
<b>Ch:5 Water Requirement for Crop</b>	Water Requirement for Crop, Crop Seasons in Maharashtra
<b>Ch:6 Water Planning</b>	Water Planning, Selection of suitable site for a reservoir, Control Levels and zones of storage in a reservoir, Silting of Reservoir, Evaporation from reservoir, Norms for Fixing Control Levels.
<b>Ch:7 Dams and Spillways</b>	Dams, Classification of Dams, Gravity Dams, Earthen Dams, Outlet Works, Spillways
<b>Ch:8 Bandhara Irrigation</b>	Bandhara Irrigation, Component Parts of Bandhara Scheme, Design of Bandhara, Percolation Tanks, Component Parts of Percolation Tank.
<b>Ch:9 Lift and Micro Irrigation</b>	Lift Irrigation, Methods of Irrigation, Drip or Trickle Irrigation, Wells, Aquifers and their Types, Important Terms Connected with Ground Water, Ground Water Flow.
<b>Ch:10 Tube Well Irrigation</b>	Introduction occurrence of ground water location, Logs or Recording of Borehole Data, Advantages and Disadvantages of Tube-well Irrigation, Types of Tube wells, Construction and Boring of Tube wells, Installing Well Screens, Well Development, Type of pumping arrangement, Factors affecting selection of Pumps
<b>Ch:11 Diversion Head Works</b>	Head Works, Layout of Diversion Head Works and its Components Parts, Weir, Barrages, Comparison between Weir and Barrage, Irrigation Department Standard Design
<b>Ch:12 Canal and Canal Construction</b>	Canal and Canal Construction, Factors affecting Alignment, Distribution System for canal Irrigation, Design Aspects of Canal, Most Economical Section of Canal
<b>Ch:13 Canal Cross Drainage Works</b>	Canal Cross Drainage Works, Types of Canal Cross Drainage Canal Regulation Works, Types of Canal Falls, Types of Canal Outlets.
<b>Ch:14 Canal Lining</b>	Canal Lining, Different Materials used for lining, Maintenance of Canals.
<b>Ch:15 Water Logging</b>	Water Logging, Effects of Water Loggings, Causes of Water Loggings, Control of Preventive Measurers, and Reclamation of salt affected lands.
<b>Ch:16 Water Assessment</b>	Water Assessment & Method Water Assessment

## Environmental Engineering

<b>Water supply Engineering</b>	
<b>Ch:1 Introduction</b>	Brief description of water supply system, Necessity of protected and planned water supply scheme, Water borne diseases
<b>Ch:2 Estimation of demand of water</b>	Domestic water demand, Industrial water demand, Institutional & commercial water demand, Fire demand, Rate of demand, Factors affecting rate of demand, Variation in rate of demand, Design period Method of population forecasting (Revised).
<b>Ch:3 Sources of water</b>	Surface sources, Ground sources, Intakes, Factors governing location and construction of intake, Points for design of intake
<b>Ch:4 Quality of Water</b>	Portable water, Impurities in water, Need for analysis of water, Test on water.
<b>Ch:5 Treatment of Water</b>	Methods of aeration, Sedimentation, Types of sedimentation tank Clariflocculator, Filtration, Methods of disinfection, Water treatment plant.
<b>Ch:6 Conveyance of Water</b>	Types of pressure pipes, Choice of pipe material, Joints in C.I. & concrete pipe, Laying of pipes, Testing of pipeline, Types of valves, cocks, fire hydrants, water meters.
<b>Ch:7 Distribution of Water</b>	Requirements of distribution system, Methods of distribution, Types of reservoirs, Layout for distribution system, Methods of supplying water
<b>Ch:8 Water Supply Arrangements in Buildings</b>	Definitions, Connection from water main to building, Water supply layout for building, Types of C.I. pipes
<b>Sanitary Engineering</b>	
<b>Ch:9 Introduction</b>	Purpose of sanitation, Necessity of building sanitation, Definitions of terms used, Collection and conveyance of sewage, Conservancy and water carriage systems, Variation in per capita water demand and sewage production with population in India, Maximum flow and minimum flow
<b>Ch:10 Building Sanitation</b>	Terms, Building sanitary fittings, System of plumbing, Principles for preparing drainage plans, Maintenance of sanitary units
<b>Ch:11 Solid waste &amp; its Disposal</b>	Classification of sanitary works, Methods of sewage disposal, Self purification of streams, Oxygen deficit of a polluted river stream and its equation, Disposal of refuse by incinerator
<b>Ch:12 Conservancy System or Rural Sanitation</b>	Introduction, Bore hole privy, Aqua privy
<b>Ch:13 Types of sewerage systems</b>	Types of sewerage systems, Difference between separate system & combined system, Sewer sections, Sewer materials, Selection of material for sewer, Design of sewer, Method of design of sewer, Laying of sewers, Types of pipe bedding, Testing of sewer, Maintenance of sewer, Forces acting a sewer pipes and their description
<b>Ch:14 Sewer Appurtenances</b>	Manhole, Drop manhole, Street inlet, Flushing tank
<b>Ch:15 Analysis of Sewage</b>	Physical characteristics of Sewage, Chemical characteristics of Sewage, Biological characteristics of Sewage, Biochemical oxygen demand, Biochemical oxygen demand test, Aerobic and anaerobic process, ISI standards for analysis of sewage

<b>Ch:16 Sewage Treatment</b>	Object of sewage treatment, General layout for sewage treatment plant Sewage treatment for small towns, Grit chamber, Skimming tank, Sedimentation tank, Sludge digestion tank, Septic tank, Gobar gas plant Oxidation pond, Oxidation ditch, Soak pit
<b>Ch:17 Industrial Waste</b>	Introduction, Dairy waste, Paper Industries, Sugar industry waste, Leather industry waste.
<b>Ch:18 Air pollution</b>	Introduction, Natural sources, Man made sources, Effects of air pollution Noise pollution, Introduction to acid rain & global warming, Global warming.

## Building Construction

<b>Ch:1 Components of Building</b>	Definition of a building classification of building based on occupancy, Introduction, Foundation, Plinth, Column, Floors, Doors, Stairs, Roof, Building Finishes, Building Services, Walls
<b>Ch:2 Foundation</b>	Concept of foundation, Introduction, Types of Foundation
<b>Ch:3 Walls</b>	Introduction, Partition Walls (Brick Partitions, Timber Partitions), Monolithic Walls
<b>Ch:4 Doors, Windows &amp; Grills</b>	Doors, Types of Doors, Windows, Fixtures and Fastenings, Size of Doors, Size of Windows, Grills.
<b>Ch:5 Sills &amp; Lintels</b>	Sills, Lintels, Arches
<b>Ch:6 Stairs, Lifts &amp; Escalators &amp; Ramps</b>	Stairs, Requirement of a Good Staircase, Rules for Design of Stairs, Types of Stairs, Lifts, Escalators, Ramps.
<b>Ch:7 Floors</b>	Introduction, Requirement of Floors in Design & Construction, Plinth, Construction of Ground Floor, Concrete Flooring, Types of floorings, Upper floors
<b>Ch:8 Roof</b>	Technical Terms, Couple-Roof, Couple - Close Roof, Drainage arrangement for pitched roofs, Lean to Roof, King-Post Roof Truss, Queen post Truss, Flat Roof, Advantages of Flat Roof, Disadvantages of Flat Roof.
<b>Ch:9 Construction processes in Earthwork</b>	Excavation, Dewatering & Dewatering Methods, Timbering of trenches
<b>Ch:10 Masonry</b>	<b>Stone masonry:</b> Dressing of stones, Classification of stone masonry <b>Brick Masonry:</b> Terms used in brick masonry, Requirements of good brick masonry construction, Bonds in Brick Masonry, Wall thickness in Brick work, Cavity Wall, Comparison between Brick masonry and Stone masonry <b>R.C.C Walls</b> <b>Reinforced Masonry Walls</b> <b>Different Types of Composite Masonry</b>
<b>Ch:11 R.C.C Work</b>	Properties of reinforced concrete, Different RCC Components in RCC Building Concrete proportion for different work, Construction Joints, Location of construction joints for different member, Expansion Joints
<b>Ch:12 Scaffolding, Shoring, Underpinning</b>	<b>Scaffolding:</b> Types of scaffolding, Components of scaffolding <b>Shoring:</b> Dead shore, Flying shore, Raking shore, Use of Shoring <b>Underpinning:</b> Situations where underpinning is required, Methods of underpinning.
<b>Ch:13 Finishing work</b>	Floor finishes, Plastering (Procedure of Plastering), External Finishes, Pointing, Roof and Roof covering, Painting, White Washing, Color Washing and Distempering, Application of Cement and Plastic Paints.
<b>Ch:14 Plumbing</b>	Planning and process involved in plumbing system, Types of pipes used Drain testing, Ground and Sewer pipes, Common sizes of pipes, Plumbing system.
<b>Ch:15 Guniting and Grouting</b>	Guniting, Grouting
<b>Ch:16</b>	Methods of Damp proofing / Water proofing, Materials used for damp –

<b>Damp proofing and Water proofing</b>	proofing, Damp proofing treatment in building.
<b>Ch:17 Termite proofing</b>	Preconstruction treatment, Site preparation, Post construction treatment Operations involved in eradicate termites, Inspection, Soil treatment for foundation, Soil treatment under floor, Treatment of woodwork.
<b>Ch:18 Electrical Works and Fire Resistant Arrangements</b>	Introduction, Wiring for domestic buildings, Fire resisting arrangement for a building
<b>Ch:19 Earthquake protection</b>	Seismic zones in India (Revised), Design considerations for construction items in brief.





## Building Materials

<b>Ch:1 Introduction</b>	Introduction, Classification of Materials, Properties of Materials
<b>Ch:2 Building Stones</b>	Classification of Building Stones, Requirement of a Good Building Stone, Quarrying of Stones, Methods of Quarrying, Effect of Quarrying On Environment, Building Stones in Maharashtra, Dressing of Stones, Types of Dressing
<b>Ch:3 Bricks &amp; Other Clay Products</b>	Introduction, Manufacturing of Clay Bricks, Classification of Brunt Clay Bricks Properties of Bricks, Tiles
<b>Ch:4 Lime</b>	Introduction, Classification of Lime, Use of Lime, Properties of Lime
<b>Ch:5 Mortar</b>	Introduction / Classification of Mortar, Properties of an Ideal Mortar
<b>Ch:6 Timber &amp; wood Based Products</b>	Properties of a Good Timber, Structure of a Timber Tree, Defects of Timber Decay of Timber, Seasoning of Timber, Methods of Seasoning, Preservation of Timber, Plywood Veneers
<b>Ch:7 Metals</b>	Classification of Metals, Ferrous Metals, Non-Ferrous Metals
<b>Ch:8 Paints &amp; Varnishes</b>	Introduction of Painting, Ingredients of Paint, Types of Paints, Introduction of Varnishes / Objectives / Use, Ingredients of Varnish
<b>Ch:9 Plastics</b>	Types of Plastics, Properties of plastic, Classification of Plastic, Use of Plastic Modern Development of Plastic
<b>Ch:10 Asbestos</b>	Introduction, Use of Asbestos
<b>Ch:11 Flooring &amp; Other Tiles</b>	Introduction, Marble Flooring, Mosaic Flooring
<b>Ch: 12 Asphalt Bitumen &amp; Tar</b>	Asphalt, Bitumen, Tar
<b>Ch:13 Glass</b>	Introduction, Properties of Glass, Use / Selection of Glass, Ingredients of Glass, Types of Glass.
<b>Ch:14 Insulating Materials</b>	Heat of Thermal Insulating Material, Sound Insulating Materials
<b>Ch:15 Miscellaneous Construction &amp; Allied Materials</b>	Fire Resistant Materials, Termite Proofing Materials, Materials Used in Interiors, Waterproofing Treatment Materials

## Concrete Technology

<b>Ch:1 Introduction</b>	Concrete / Advantages, Process Diagram
<b>Ch:2 Properties of Concrete</b>	Introduction, Workability, Freedom of Segregation, Freedom of bleeding Properties of hardened Concrete
<b>Ch:3 Properties, Types &amp; Testing of Concrete</b>	Cement, Chemical Composition, Testing of Cement, Standard Specification for Portland cement grades, Weight of Cement Bag, Cement Storage, Removal of Cement Bags
<b>Ch:4 Properties, Types &amp; Testing of Aggregates</b>	Aggregates, Types of Aggregates, Properties of Aggregates, Requirement of good Aggregates, Grading of Aggregate, Bulking of sand, Bulking of Coarse, Medium, Fine sands, Proportion of aggregates, Storing of aggregates, Sieve analysis, Aggregate Crushing value, Aggregate Impact value, Aggregate Abrasion value Flakiness Index, Impurities in aggregate, Deleterious Constituents
<b>Ch:5 Quality of Water &amp; Water Cement Ratio</b>	Role of Water in concrete / Quality of mixing water, Water Cement Ratio / Importance of water cement Ratio, Selection of water Ratio and its effects on strength of Concrete / Water cement ratio law, Fineness test of cement, Sieve test
<b>Ch:6 Types &amp; Uses of Admixtures in concrete</b>	Admixture, Air entraining Agents, Pozzolanic materials, Accelerators, Retarders Gas forming agents, Detraining agent
<b>Ch:7 Workability</b>	Importance of workability / Segregation, Factors affecting workability, Measurement of workability (Slump test), Measurement of workability (Compaction factor test)
<b>Ch:8 Batching of Concrete</b>	Batching / Purpose of batching, Batching operation, Volume batching, No Fines Concrete
<b>Ch:9 Mixing of Concrete</b>	Importance and purpose of mixing, Hand mixing, Machine mixing, Batch mixing Capacity of mixers / Maintenance of mixers
<b>Ch:10 Transportation of Concrete</b>	Different modes of transportation, Precautions in transporting concrete
<b>Ch:11 Deposition of Concrete</b>	Placement of concrete / Preparing sub grades, Placing concrete in form work Requirements of good form work, Material used for form work, Types of form work / Column, For R.C.C. beam / For wall footing, For slab, Removal of form work
<b>Ch:12 Compaction of Concrete</b>	Introduction, Necessity of compaction, Hand compaction / Mechanical compaction, Advantages of mechanical vibrator / Precaution during compaction.
<b>Ch:13 Finishing of Concrete</b>	Purpose of Finishing, Finishing operation
<b>Ch:14 Curing of Concrete</b>	Objectives of curing, Method of curing, Recommended duration for curing
<b>Ch:15 Joints in Concrete Construction</b>	Necessity of joints, Construction Joints, Expansion and contraction Joints in buildings.
<b>Ch:16 Waterproofing in Concrete Construction</b>	Importance and need of water proofing

<b>Ch:17 Non Destructive Tests on Concrete</b>	Non Destructive Testing Methods, Different method of N.D.T.
<b>Ch:18 Different types of Concrete</b>	Light weight concrete, Precast concrete, Prestressed concrete, Air-Entrained Concrete Ready Mix Concrete (RMC), Ferro cement Concrete, High Strength Concrete, Under water concreting,
<b>Ch:19 Hot &amp; Cold Weather Concreting</b>	Hot weather concreting, Precautions before placing concrete, Precautions during and after concreting, Cold weather concreting, Precautions before and during placing of concrete, Precautions after placing concrete
<b>Ch:20 Concrete Mix Design</b>	Introduction, Aims of Mix Design, Various Method of Concrete Mix Design, Indian Standard method
<b>Ch:21 Repairs of Concrete Works</b>	Methods of Repairing, Dry Pack Method, Replacement of Concrete Method, Mortar Replacement method, Formation of hair Cracks in Between, Treatment for protection Against Weathering.



## Soil Mechanics

<b>Ch:1 Introduction</b>	Soil Mechanics, Soil Engineering, Importance Of Soil And Use Of Soil Mechanics, Effect Of Ground Reality, Errors In Construction, Types Of Foundations, Designs Of Foundation, Different Super-structure And Sub-structure Patterns, Different Types Of Super-structure And Raft Foundations, Different Types Of Super-structure And Strip Foundations, Geological origin of soils
<b>Ch:2 Physical Properties Of Soil</b>	Soil As Three Phase System, Water Content Or Moisture Content (w) Density of Soil / Bulk Density / Dry Density, Mass density of solids / Saturated density / Submerged density, Unit Weight of soil mass, Specific Gravity, Void ratio, Porosity, and degree of saturation, Percentage air voids / Air Content, Density index, Relative density, Functional Relationship In Terms of densities, Determination of Index Properties, Oven drying Method, Determination of Specific Gravity, Determination of In-situ density, voids ratio & density index, Sand Replacement Method, Core Cutter Method, Consistency Limits / Plasticity, Consistency Limits (Atterberg's limits), Liquid Limit, Plastic Limit / Shrinkage Limit, Plasticity index / Consistency index, Liquidity Index, Determination Of Liquid Limit, Determination of Plastic limit, Determination of Shrinkage Limit, Particle size distribution / Sieve Analysis, Particle size distribution curve / Grading of Soils, Effective diameter, uniformly coefficient and coefficient of curvature, Soil Classification, Boundary Classification, General Characteristics of soils of different groups, Ground water depth, Structural changes in Granular Soil, Topography Of Ground Surface & Water Table, Load carried by soil particles
<b>Ch:3 Permeability of soil and Seepage analysis</b>	Darcy's Law, Values of coefficient of Permeability for different soils, Constant head Permeability Test, Falling head permeability Test, Factors affecting permeability of soils, Seepage, Characteristics of Flow Net, Seepage through earthen structure, Flow net
<b>Ch:4 Shear Strength of Soil</b>	Shear Strength, Mohrs circle, Stress system with principle planes parallel to coordinate axes, Stress system with vertical and horizontal planes not principle planes, Mohrs Coulomb Failure Theory, Effective Stress Principle, Limitations of Mohr-Coulomb Theory, Measurement of Shear Strength, Direct Shear Test, Unconsolidated Undrained Test, Consolidated Undrained Test, Consolidated drained Test, Presentation of results of direct Shear Test, Triaxial Compression Test, Triaxial Tests on Cohesive soils/ Cohesionless soils, Computation of various Parameters, Presentation of results of Triaxial Tests, Unconfined Compression Test, Vane Shear Test, Shear strength of partially saturated soils, Shear characteristics of cohesionless soils, Shear characteristics for cohesive soils, Choice of test conditions and shear parameters, FEM Illustrations
<b>Ch:5 Bearing capacity of soils</b>	Bearing Capacity, Bearing Capacity Concept, Terzaghi's Analysis Effect of water table on bearing capacity, General Equation, Plate load test, Standard Penetration Test, Typical values for bearing capacity from IS: 1904, FEM Illustrations, Practical Cases / Considerations, Bearing Capacity from Building Codes, Factors Affecting Bearing Capacity, Pressure Distribution Diagrams
<b>Ch:6 Earth Pressure</b>	Lateral Earth Pressure Categories, Structure subject to earth pressure, Earth Pressure at Rest, Rankine's Earth pressure Theory, Active pressure acting on retaining wall, Passive Earth Pressure, Passive pressure acting on retaining wall, Active pressure for cohesion less backfill, Active pressure for cohesive backfill, Pressure distribution diagram, Practical cases / considerations
<b>Ch:7 Stability of Slopes</b>	Introduction, Failure of slopes, Friction Circle Method, Practical cases / considerations

<b>Ch:8 Compaction of Soil</b>	Field situations where compaction is required, Standard proctor Test, Compaction curve, Modified proctor test, Factors Affecting, Compaction, Different Methods, California Bearing Ratio Test, Consolidation, Spring analysis for primary consolidations, Difference between compaction and consolidation, Analogy consolidation settlement, Pavement construction, Lateral movement and Plastic flow, Heaving, Consolidation of Laterally confined soil, Terzaghi's Theory of One Dimensional, Total Settlement, Secondary Consolidation Settlement, Modes of settlements
<b>Ch:9 Stabilization</b>	Soil stabilization, Use, Different methods of soil stabilization, Geosynthetics, Geotextiles as filter, Geotextiles as drain, Geotextiles used as reinforcement in retaining wall, Practical cases/ considerations
<b>Ch:10 Site Investigation &amp; sub soil exploration</b>	Necessity of site investigation, Types of exploration, Depth of Exploration, Location and number of bores, Methods of Exploration, Open Excavation Methods, Boring for Exploration, Types of soil samples, Factors affecting soil samples, Samplers, Standard Penetration Test, Dilatancy Correction, Over burden pressure correction, Correlation of SPT value, Other methods of In-situ testing, Electrical resistivity method, Subsoil investigation report, Practical cases / consideration,



## Theory of Structure

<b>Ch:1 Simple Frames</b>	Frames, Classification of Frames, Assumption in Analysis of Frame, Methods of Analysis of Frame
<b>Ch:2 Direction and Bending Stresses</b>	Concept of Direct Load, Concept of Eccentric Load, Eccentricity About One Principle Axis, Stress Distribution at Base, Condition for No Tension, Limit of Eccentricity for Circular Section, Core of Section, Wall Subjected to Lateral Wind Pressure, Cylindrical Masonry Chimney Subjected to Lateral Wind Pressure,
<b>Ch:3 Slope &amp; Deflection</b>	Concept of Slope & Deflection, Slope & Deflection Subject to Pure Bending, Correlation of Slope & Deflection & Radius of Curvature, Double Integration Method Slope & Deflection, Boundary Condition of Beam, Std. Cases for Double Integration Application, Macaulay's Method.
<b>Ch:4 Fixed Beams</b>	Fixed Beams, Concept of Effect of Fixity, Advantages & Disadvantages of Fixed Beam, Principle of Superposition, Derivation of Fixed Beam Subjected to Central Point Load, Fixed Beam Carrying UDL over Entire Span, Fixed Beam Carrying an Eccentric Point Load.
<b>Ch:5 Continuous Beam</b>	Continuous Beam, Effect of Continuity, Concepts of Deflected Shape Clapeyron's Theorem of Three Movements, Application of Clapeyrons Theorem to Various Continuous Beam, Steps to Draw BMD, Steps to Draw SFD
<b>Ch:6 Moment Distribution Method</b>	Carry Over Factor for Different Cases, Stiffness Factor for Different Cases, Distribution Factor, Moment Distribution For Continuous Beam, Application of Moment Distribution Method, Symmetrical Portal Frame.
<b>Ch:7 Columns</b>	Types of End Conditions for Columns, Effective Length of Columns, Classification of Column, Buckling of Axially Loaded Compression Member, Euler's Theory & Assumption, Euler's Formula, Ranking Theory
<b>Ch:8 Matrix Method</b>	Matrix Method, Element of Matrix Algebra, Application of Matrix, Method to Plane Trusses, Matrix Analysis of Continuous Beam by Flexibility Matrix.



### Repair and Maintenance of Civil Works

<b>Ch:1 Principals of Maintenance</b>	Definitions, Causes of Deterioration and Decay of Civil Works, Maintenance Generator.
<b>Ch:2 Maintenance Standards</b>	Normal Routine Maintenance Items, Determination of Maintenance Standards, Stability, Freedom from Dampness, Natural Lighting, Ventilation, General Requirements of Water Supply, Drainage and Sanitary Conveniences.
<b>Ch:3 Defects</b>	Broad List of common defects, Methods of Investigations
<b>Ch:4 Maintenance Organizations</b>	Inspections, Proforma for classification of Maintenance Operations, Further type of work under Civil Maintenance, Preparation of Estimates for Maintenance Work, Tendering and Award of Work, Provision of Important Clauses in the Tender, Maintaining Departmental Labour Items for Petty Repairs, Imprest, Contract Works, Record keeping for Effective Management of Civil Maintenance.
<b>Ch:5 Maintenance Problems and their Solutions</b>	Foundation Problems, Waterproofing, Leaking Basements and Roofs Treating Dampness in Walls, Omission of DPC and By-Passing of DPC, By-Passing of damp-proof course, Window Sills, Down Pipes and Other areas of Damp Penetration, Cracks in walls – Horizontal, Vertical, Diagonal, Care of Floors, Removing Stains from Floors, Timber Defects, Maintenance Problems of Plumbing, Maintenance of Roads, Maintenance of bridges, culverts, and causeways, Strengthening of canal embankments

## Hydraulics

<b>Ch:1 Introduction</b>	Definition of fluid, Introduction to the Fluid Mechanics & Hydraulics Difference between solid and fluid, Branches of Hydraulics
<b>Ch:2 Physical Properties of Fluids</b>	Physical Properties of Fluids, Newton's Law of Viscosity, Types of Viscosity, Ideal and Real Liquid
<b>Ch:3 Hydrostatic pressure on structure and its determination</b>	Pascal's Law, Total Hydrostatic Pressure, Variation of a pressure in a fluid, Pressure at a point in a liquid, Pressure diagram, Total pressure on vertical plane surface, Center of pressure for a vertical plane surface, Total pressure on inclined plane surface, Center of pressure for inclined plane surface, Applications of Pascal's law
<b>Ch:4 Pressure in pipes &amp; its determination</b>	Pressure Head, Piezometer tube & its working, Bourdon's pressure gauge & its working, U tube manometer, Differential manometer & its type, Absolute pressure, Gauge pressure & Vacuum pressure
<b>Ch:5 Fundamental of Fluid Flow</b>	Types of fluid flow, Continuity equation, Reynold's number, Streamline Equipotential Line, Flow net and its uses, Bernoullies Theorem, Pressure, Datum, Velocity & total head, The Momentum Equation, Modified Bernoullies Equation.
<b>Ch:6 Flow Through Pipes</b>	Flow Through Pipes, Darcy Weisbach Equation, Minor Loss of Head in Pipe Flow, Pipes in Parallel, Equivalent Pipe, Hydraulic Gradient Line, Total Energy Line, Water Hammer in Pipe, Cases of Water Hammer in Pipes, Nomogram For Design of Water Distribution System, Moody's Diagram, Flow from one reservoir to another through long pipe of uniform and composite section.
<b>Ch:7 Flow Through Open Channel</b>	Types of channel, Geometrical Properties of Channel Section, Discharge through Open Channel by Chezy's formula, Manning's Formula, Froude Number, Critical, Sub-critical & Super-Critical Flow, Most economical channel section, Most economical rectangular channel, Most economical Trapezoidal channel, Hydraulic jump and its uses
<b>Ch:8 Flow Measurements</b>	Pitot's Tube, Notches & it's types, Discharge Over a rectangular notch, Discharge Over a triangular notch, End contraction and their effects, Velocity of approach, Francis Formula, Velocity measuring devices for channels, Broad Crested Weir, Discharge of an Ogee Weir, Flumes and its types, Venturimeter & its working, Flow through Orifice, Types of Orifice, Velocity Area Method for Computing Stream flow, Flow through totally drowned orifice, Flow through partially drowned orifice, Time of emptying rectangular/circular tanks with flat bottom.
<b>Ch:9 Simple Hydraulics Machine</b>	Pump Definition, Different Types of Head, Centrifugal Pump and Its Working, Reciprocating pump & its Working, Difference between centrifugal and reciprocating pump, Types of Turbines

## Advanced Construction Technology

<b>Ch:1 Residential building</b>	Construction procedure of RCC residential building.
<b>Ch:2 Repairs &amp; maintenance</b>	Maintenance of flat or Low-slope Roots, Maintenance of Steep Slope Roots, Foul Drainage, Drain Testing, Sanitary Appliances, Sanitary Pipe work, Water supply and Distribution, Maintenance problems and their solutions
<b>Ch:3 Foundation</b>	Bearing capacity of soils, Plate load test, Foundation-Introduction, Shallow foundations, Deep foundations, Bearing piles, Friction piles, Under-reamed piles, Form work needed for foundation, Timbering of the sides of trenches, Complete excavation with sloping sides, Complete excavation with timbered sides, Perimeter trench method, Drainage from foundation soil.
<b>Ch:4 Framed structures and bearing walls</b>	Introduction, Structural steel frames: Small frame, R.C.C. Frames, Combination of frames and bearing walls, Frames and sling forms, System formwork, Kwikform System
<b>Ch:5 Scaffolding, Shoring, Underpinning</b>	Scaffolding, Shoring, Underpinning
<b>Ch:6 Other Construction Aspects</b>	Construction aspects of fire proofing, Fire protection requirements for Multi-storied building, Acoustic treatment for Building, Auditorium, Acoustical design of Auditorium, Construction aspect of Earthquake resistant structure, Placement of house in the case of slopes, Shape of plan, Structural design aspects, Guidelines for Load Bearing construction, Use of Interlocking blocks, Use of Ring Beam as roof support
<b>Ch:7 Building Bye-Laws and Codes</b>	Introduction, Regulations regarding layout, Building regulations, Rules for special type of building, Calculation of plinth and carpet area

## Design of Structure

<b>Design of Concrete Structure-WSM</b>	
<b>Ch:1 Introduction</b>	Structural Design (Working Stress Method), Assumptions in Working Stress Method for Design of Members, Permissible Stresses in Steel Reinforcement, Permissible Stresses in Concrete
<b>Ch:2 Singly Reinforced Section</b>	Definition, R.C. Sections In Flexure Working Stress Method Assumptions, Find the Neutral Axis, Balanced Reinforced Section, Under Reinforced Section, Over Reinforced Section, Movement of Resistance.
<b>Ch:3 Doubly Reinforced Section</b>	Doubly Reinforced Sections, Essential Cases, Determine the Neutral Axis, Movement of Resistance.
<b>Ch:4 Design of Flanged Section</b>	T-Beams and L-Beams General, Effective Width of Flanged, Control of Deflection, Slenderness Limits for Beams to ensure Lateral Stability, Neutral Axis, Lever Arm of the T Beam, Movement of Resistance, Design steps of T Beam, Doubly Reinforced T Beam, L Beam Flange Width of Beam, Design of L Beam
<b>Ch:5 Shear and Development Length</b>	Shear and Development Length, Maximum Shear Stress, Shear Strength of Concrete, Maximum Shear Reinforcement, Shear – Reinforcement Design, Design Steps, Bond and Development Length
<b>Ch:6 One Way slab</b>	One Way slab Design, Types of Slab, Ratio of span to depth, Reinforcement, Diameter of Bars, Cover to Reinforcement, Dead Load, Slab Carrying Concentrated Load, Continuous Slab, The Slab Design Steps
<b>Ch:7 Two Way Slab</b>	Two Way Reinforcement Slab, Two Way Simply Supported Slab, Restrained Slabs, When the Restrained slab Condition Occurs , Points to be considered while Designing Torsion Reinforcement in Two Way Slab, Designing of Simply Supported Two Way Slab
<b>Ch:8 Staircase</b>	Types of Staircase, General Information, Distribution of Loading on Stairs, Stairs Spanning Horizontally, Design steps of Stairs Spanning Horizontally, Stairs Spanning Longitudinally, Design Steps Stairs Spanning Longitudinally (Dog Legged Staircase), Design of Open Well Newel Staircase
<b>Ch:9 Columns</b>	Types of Columns, The Load Carrying Capacity of Short Column, Reinforcement, Short Column with Helical Reinforcement, Strength of Concrete, Strength of Steel, Effective Length of Column, Design Steps, Members Subjected to Combined Axial Load and Bending, Cracked Section Uniaxial Bending
<b>Ch:10 Column Footing</b>	Introduction, Types of Footing, Design for Axial Load, Movements and Shear Design of Column Footing, Introduction of Eccentric Footing
<b>Ch:11 Retaining Wall and Water Tank</b>	Cantilever Type Retaining Wall, Minimum Depth of the Foundation, Stability of the Retaining Wall, Following Points Should be Considered for the Stability of the Retaining Wall, Factor of Safety for Overturning, Factor of Safety for Sliding, Earth Pressure on Retaining Wall, Trial Dimensions of Wall, Design of stem of Retaining Wall, Thickness of Stem, Counterfort Retaining Wall, Components of Retaining Wall, The Loads on Heel Strip Slab, Toe Slab, Counterforts, Design of Shear Key (Retaining Wall), Water Tanks: Steps for Designing of Water Tanks, Circular Tanks with the Wall Restrained at the Base, Dr. Reissner's Method, The Cantilever Bending Moments, Carpenter's Simplification of Dr. Reissner's Method, Rectangular Tank Resting on Ground
<b>Design of Concrete Structure-LSM</b>	
<b>Ch:12 Introduction</b>	Concrete and Reinforced Concrete, Reinforcing Material, Grades of Concrete and Steel, Methods of Designs

<b>Ch:13 Structural Design (L.S.M.)</b>	Limit State, Various Limit States, Limit State of Collapse, Important conditions under which limit state of collapse can be reached, Limit State of Serviceability, Main categories of the serviceability limit state, Characteristic Values, Characteristic Load, Design Values, Partial Safety Factors
<b>Ch:14 Singly Reinforced Section</b>	Stress-Strain Curves, Stress Block Parameters, Analysis of Singly Reinforced Section, Area of Stress Block, Limiting values of Mu, Design of Singly Reinforced Section, Concept of Curtailment of Reinforcement, Concept of Redistribution of Moment.
<b>Ch:15 Doubly Reinforced Section</b>	Doubly Reinforced Sections, Conditions for Doubly Reinforced Section, Analysis of Doubly Reinforced, Design of Doubly Reinforced Section
<b>Ch:16 Flanged Section</b>	Introduction, Analysis of Flanged Sections, Design of Flanged Sections
<b>Ch:17 Limit State of Collapse Shear</b>	Nominal Shear stress, Design Shear Strength of Concrete, Minimum Shear Reinforcement, Design Shear Strength Reinforcement, Development Length, Anchoring Reinforcement Bars, Anchoring Bars in Tension, Bends and Hooks Anchoring Bars in Compression, Torsion in Concrete Member
<b>Ch:18 One Way Slab</b>	Introduction, Effective Span, Control of Deflection, Design of One Way Slab (Simply Supported and Cantilever)
<b>Ch:19 Two Way Slab</b>	Introduction, Simply Supported Continuous Slab without Torsion Reinforcement, Design of Simply Supported Two Way Slab, Two Way Slabs with Torsion Reinforcement
<b>Ch:20 Stairs</b>	Introduction, Types of Stairs, Effective Span of Stairs, Distribution of Loading on Stairs, Design of Legged Stairs
<b>Ch:21 Retaining Wall and Water Tank</b>	Introduction, Trail Dimensions of the wall, Earth Pressure on Walls, Stability of Retaining wall, Design of Steam of Retaining Wall, Thickness of Stem
<b>Ch:22 Limit State of Collapse Compression</b>	Introduction, Types of Columns, General Notes on Design of Columns, Assumptions, Minimum Eccentricity, Design of Short Axially Loaded Member in Compression, Design Steps, Member Subjected to Combined Axial Load and Uniaxial Bending, Design Procedure for Uniaxial Bending, Member Subjected to Axial Load and Biaxial bending
<b>Ch:23 Footing</b>	Introduction, Types of Footing, Design for Axial Load, Moments and Shear, Design Steps for Footing, Introduction to eccentric Footing (Reinforcement Details), Reinforcement for Pile and Pile Caps, Reinforcement in Piles, Pile Caps, Reinforcement for Pile Caps
<b>Ch:24 Earthquake Resistant Structures</b>	
<b>Ch:25 Miscellaneous Structure</b>	Introduction of Building Frame, Terms Should be considered while analyzing Frame, Analysis of Building Frame, Steps for Analysis of a Frame
<b>Ch:26 Prestressed Concrete</b>	Concept of Prestressed Concrete, Combined Effect of Service Loads and Prestresses, Method of Prestressing, Post-Tensioning, Advantages of Prestressing, Disadvantages, Prestressing equipments, Prestress Loss
<b>Design of Steel Structure</b>	
<b>Ch:27 Introduction</b>	Types of Sections Used, Grades of Steel and Strength Characteristics, Advantages of Steel, Disadvantages of Steel, Types of Loads on Steel Structure and I.S. Code Specifications for Loading on Structure, Introduction to Seismic Load, Stability of Structure Against Seismic Action, Value of Factor for
<b>Ch:28 Riveted Connections</b>	Types of Rivets and their use, Failures of Riveted Joints, Assumptions Pitch and Edge Distance, Minimum Pitch, Maximum Pitch, Gauge, Edge Distance, Permissible Stresses, Steps for Calculating Strength and Efficiency of Joints, Steps for Calculating number of Rivets when the Load on connection

<b>Ch:29 Welded Connections</b>	Types of Welded Connection, The Other Types of the Welds, Strength of Weld Permissible Stresses in Weld, Design of Butt Weld, Steps for Designing Butt Weld, Design of Fillet Weld, Design of Welded Joint Carrying Axial Load
<b>Ch:30 Design of Tension Member</b>	Types of Sections Used, Permissible Stress in Section used, Gross and Net Sectional Area of Tension Member, Analysis of Tension Member, Design Tension Member, Lug Angle, Specifications for the design of Lug angles as per IS: 800 1984 Clause 8.8
<b>Ch:31 Design of Compression Member</b>	Introduction, Types of Sections Used, Effective length of Compression members with constant dimensions and Effective length of strut, Gross Area, Radius of Gyration, Slenderness Ratio and its Limit, Permissible Stresses in Compression Member, Load Carrying Capacity of Angle Strut, Steps for Calculating Load Carrying Capacity (or safe load), When the Section to be used is given, are as Follows, Design of Angle Strut
<b>Ch:32 Stanchions &amp; Columns</b>	Sections Used, simple and built-up, Effective Length for Different End Conditions, Conditions for Economical Section, Design of Built-up Columns, Introduction of Lacing
<b>Ch:33 Steel Roof Truss</b>	Introduction, Important Terms related to Roof Truss, General Specification, Live Load Intensity, Types of Steel Roof Truss for Different Spans, Calculation of Panel Load for Dead Load, Live Load and Wind Load for Steel roof truss when Span of the truss is given, Designing Tension and Compression Members in a Steel Roof Truss
<b>Ch:34 Beams</b>	Introduction, Types of Beams, Different steel section used, Simple Beam and Built up Beam, Permissible Bending Stresses, Effective Span, Design of Simple Beam for Flexure, Design of Built-up Beam
<b>Ch:35 Welded Plate Girder</b>	Introduction, Welded Plate Girder, Necessity of Plate Girder, Elements of Plate Girder, Self Weight of Plate Girder, Design of Web, Design of Flanges, Check for Shear and Bending Stresses, Types of Stiffeners, Bearing Stiffener, Intermediate Stiffeners, Vertical Stiffeners, Horizontal Stiffeners, Curtailment of Flange Plates
<b>Ch:36 Design of Connections (Riveted)</b>	Introduction, Design of Beam to Column Connection (Framed Connection Riveted), Simple Beam to Beam Connection (Riveted), Design Procedure of Beam to Beam Connection
<b>Ch:37 Column Base</b>	Introduction, Types of Column Bases, Design of Slab Base and Concrete Block Design of Gusseted Base

## Estimation and Costing

<b>Ch:1 Introduction</b>	Introduction, Purpose of estimating and costing, Types of estimates, Objectives of Estimating & Costing
<b>Ch:2 Types of Estimates</b>	Approximate estimate, Detailed estimate
<b>Ch:3 Modes of measurement</b>	Units of measurement, Principle for selection of quantities, Modes of measurement, Accuracy for taking measurement, Method of measurement of formwork, Method of measurement concrete, Method of measurement of brickwork, Deduction for R.C.C. work, Deduction in concrete volume, Deduction excluded for brick wall calculation, Deduction for plastering, Deduction for painting
<b>Ch:4 Procedure for Preparing Detailed Estimate</b>	Long wall / short wall method, Center line method, Procedure of detailed estimate, Provisional sum, Prime cost, Day work, Preparing bill of quantities, Provision in detailed estimate, Quantities for RCC structural members, Estimate of earth work in road, Detailed Estimates of Various Items.
<b>Ch:5 Specifications</b>	Specification / Necessity of specification, Types of specifications, Specification of items
<b>Ch:6 Rate Analysis</b>	Definition / factors affecting rate analysis, Quantity for different items of work, Task work, Standard schedule of rates, Requisites for preparing rate analysis, Quantity of materials for brick masonry, Rate analysis for first class brick work, Quantities of various materials for different works
<b>Ch:7 Valuation</b>	Definition / necessity of valuation, Scrap value / salvage value, Book value Speculative value, Sinking fund / depreciation, Obsolescence, Method of depreciation, Gross income / net income / outgoings, Various type of outgoings, Year purchase, Capitalized value
<b>Ch:8 Contracts</b>	Definition (contract), Types of Engineering contracts
<b>Ch:9 Tender and Tender Notice</b>	Introduction, Earnest money, Security deposit / validity period, Rejection of tenders, Specimen tender notice, Ring formation / unbalanced tender, Points to be observed, Procedure of submission of tenders, Opening and acceptance of tenders, Work order
<b>Ch:10 Tender Documents</b>	List of tender documents, Schedule A, Schedule B, Schedule C, Time limit Termination of contract, Defect liability period, Penalty, Liquidated damages Arbitration, Rate list, Suspension of work, Advance payment
<b>Ch:11 Procedure of Execution of Work by P.W.D.</b>	Organization of P.W.D., Functions of P.W.D. personnel, Administrative approval, Methods used in P.W.D.
<b>Ch:12 Accounting in P.W.D.</b>	Measurement book, Imprest , Temporary address, Indent or issue of the material, Bills, Voucher, Cash book, Nominal muster roll
<b>Ch:13 Payment of Contractor</b>	Modes of payment to contractors, Retention money, Reduced rate payment Petty advance, Mobilization advance

### Building Services

<b>Ch:1 Water Supply</b>	Water as a natural resource, Sources of water, Public health significance of water quality, Demand of water, Storage and Distribution of Water
<b>Ch:2 Drainage</b>	Types of sewerage systems, Difference between separate system & combined system, Sewer sections, Sewer materials, Selection of material for sewer Design of sewer, Method of design of sewer, Laying of sewers, Types of pipe bedding, Testing of sewer, Maintenance of sewer, Types of sewerage systems Traps – shapes, sizes, types, materials and function, Ventilation of house drainage – anti siphonage and vent pipes, single stack system
<b>Ch:3 Fire Provisions</b>	Construction aspects of fire proofing, Fire protection requirements for Multi-storied building
<b>Ch:4 Sound Insulation</b>	Acoustic treatment for Building, Auditorium, Acoustical design of Auditorium
<b>Ch:5 Lighting and Electrical Fittings</b>	Different types of lighting, quality of light of mercury lamps, incandescent lamps, fluorescent tubes and lamps, various systems of wiring. Preparation of electrical layout of a simple residential building Precautions to avoid electrical accidents



## Engineering Drawing

<b>Part I</b>	
<b>Ch:1 Lines, Lettering Dimensioning &amp; Scales</b>	Drawing Board, T- square, Set- square, Drawing instrument box, Scales Protractor, French curves, Drawing papers, Drawing pencils, Sand paper block, Eraser (Rubber), Drawing pins, Duster, Drafting machine
<b>Ch:2 Orthographic Projections and Interpretation of Given Views</b>	Principal plane, Frontal plane, Horizontal plane, Profile plane
<b>Ch:3 Isometric Projections</b>	Isometric lines, projections, planes, Isometric scale, Isometric graph, Drawing an object using graph
<b>Ch:4 Curves Used, Engineering Practice and Loci of Points</b>	Rectangle oblong method, Concentretic circle method, Arcs of circles method
<b>Part II</b>	
<b>Ch:1 Projection of Points &amp; Lines</b>	Object: lines, Projection on vertical plane, Projection on horizontal plane
<b>Ch:2 Projection of Planes</b>	Object: Plane, Projection on vertical plane, Projection on horizontal plane
<b>Ch:3 Projection of solids</b>	Object: Square, Projection on vertical plane, Projection on horizontal plane
<b>Ch:4 Selection of Solids</b>	Full selection, Half selection, Offset selection, Revolved selection

**NDT-Non-Destructive Testing**

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

## GIS - Geographical Information System

<b>Ch:1</b> Introduction & Overview	Meaning of GIS, Features of GIS, Functions of GIS, Working of GIS, Project & registration, Components of GIS, GIS-Technology Innovations, Major Application Areas of GIS.
<b>Ch:2</b> Map & Map Analysis	Introduction, Meaning of Map, Types of Maps, Characteristics of Maps, General Mapping Concepts, Map Scale, Selecting a scale for a Map, Describing Scale, Map Projections, Projection System, Use of Maps, Automated and Computer assisted Cartography, GIS and Computer Cartography, GIS Compared to Maps.
<b>Ch:3</b> <b>Raster &amp; Vector</b>	The Data Model, Creating a Raster, Cell Values, Map Layers, Example Analysis Using a Raster GIS, Raster GIS Capabilities, Introduction to Vector Data Model, Database creation, Example Analysis using a vector GIS, Standard Query Language, Reclassify, Dissolve and Merge, Reclassify, Dissolve and Merge: Forestry Example, Dissolve and Merge: City Zoning Example, Comparison between Raster and Vector, Advantages and Disadvantages of Vector. Topological Overlay.
<b>Ch:4</b> <b>Spatial Analysis</b>	Manipulation and Transformation of Spatial Data, Integration and Modeling of Spatial Data, Integrated Analytical Functions of GIS, Proximity Analysis, Network Analysis, Three Dimensional Analysis.
<b>Ch:5</b> <b>Data for GIS</b>	Map Data Needed, Data Capture, Data Integration, Data Formats, Data Structures.
<b>Ch:6</b> <b>Database Concept</b>	Data Modeling, Spatial Databases.
<b>Ch:7</b> <b>Making Maps with GIS</b>	Meaning of a Map, Maps as a GIS, Map function in GIS, Cartographic Elements, Choosing a wrong type, Choosing a Map type, Factors of Choosing a Map type, Map Design, Making of Maps.
<b>Ch:8</b> <b>Implementation of GIS</b>	Need Assessment, System Analysis, Data Acquisition, Data Distribution, Staffing, Training, Maintenance, Cost Benefit, Contract Specifications, Contract Vehicles.
<b>Ch:9</b> <b>Introduction to Remote Sensing</b>	Meaning of Remote Sensing, Electromagnetic Radiation, The Electromagnetic Spectrum, Interaction with Atmosphere, Radiation –Target Interaction, Passive v/s Active Sensing, Characteristic of Images.
<b>Ch:10</b> <b>Satellite &amp; Sensors</b>	On the ground, in the air, in the space, Satellite Characteristics, Spatial Resolution, Pixel Size and scale, Spectrum Resolution, Radiometric Resolution, Temporal Resolution, Camera and Aerial Photography, Multispectral Scanning, Thermal Imaging, Geometric Distortion in Imagery. Weather Satellite / Sensors, Land Observer Satellites/Sensors, Marine Observer Satellites/Sensors, Other Sensors, Data Reception , Transmission and Processing.
<b>Ch:11</b> <b>Microwave &amp; Remote Sensing</b>	Introduction, Radar Basics, Viewing Geometry and Spatial Resolution, Radar Image Distortion, Target Interaction and Image Appearance, Radar Image Properties, Advance Radar Applications, Radar Polarimetry, Airborne v/s Spaceborne radar, Airborne and Spaceborne radar system.
<b>Ch:12</b> <b>Image Integration &amp; Analysis</b>	Introduction, Elements of Visual Interpretation, Digital Image Processing, image classification and analysis, Image Enhancement, Image Transformation, Image Classification and Analysis, Data Integration and Analysis.
<b>Ch:13</b> <b>Applications of Remote Sensing</b>	Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land Cover and Land use, Mapping, Ocean and coastal monitoring.
<b>Ch:14</b> <b>GPS Basic</b>	Introduction, Introduction to Global Positioning System, Theory

<b>Ch:15 GPS Working &amp; Basic Navigation</b>	Operating Principal, Selected Availability, GPS Receivers Set-ups, Most common set-up Components, GPS Receivers Basic Uses, Saving Current Position as a Waypoint, GOTO, Navigation, Summary of GPS Basic Use, Grid Systems
---	---