

# **Faculty of Engineering & Technology**

Study and Evaluation Scheme

Of

Diploma (Engineering)- 3Years

**Diploma (Engg.)- Civil Engineering**

**II & III Year**

(Applicable w.e.f Academic Session 2015-18 till revised)



## **AKS UNIVERSITY, SATNA**

Study and Evaluation Scheme

**\*\* The University Authorities reserve all the rights to make any additions/ deletions or changes/ modifications to this syllabus as deemed necessary.**

**Faculty of Engineering & Technology**  
**Department of Civil Engineering**  
**Diploma (Civil Engg.)**

**III Semester**

**TEACHING & EXAMINATION SCHEME**

Sr.No	Paper Code	Subject	Credit (L-T-P)			Total Credit (Theory+ Practical)
			L	T	P	
1	07CE301	Material Technology	4			4
2	07ME302	Hydraulics	4			4
3	07CE303	Civil Engineering Drawing	4			4
4	07CE304	Surveying-I	4			4
5	07EE305	Basic Electrical & Electronics	4			4
1	07ME351	Hydraulics Lab			2	1
2	07CE352	Civil Engineering Drawing Lab			2	1
3	07CE353	Surveying-I Lab			2	1
4	07CE354	Material Technology Lab			2	1
5	07EE355	Basic Electrical & Electronics (LAB)			2	1
		<b>Total Credit</b>				<b>26</b>

**Faculty of Engineering & Technology**  
**Department of Civil Engineering**

**Diploma (Civil Engg.)**

**IV Semester**

**TEACHING & EXAMINATION SCHEME**

Sr.No	Subject Code	Subject Name				Total Credit
			L	T	P	
1	07CE401	Building Construction Technology	3	1		4
2	07CE402	Concrete Technology	3	1		4
3	07CE403	Soil Mechanics	3	1		4
4	07CE404	Mechanics of Structures	3	1		4
5	07CE405	Surveying-II	3	1		4
1	07CE451	Building Construction Technology Lab			2	1
2	07CE452	Concrete Technology Lab			2	1
3	07CE453	Soil Mechanics Lab			2	1
4	07CE454	Mechanics of Structures Lab			2	1
5	07CE455	Surveying-II Lab			2	1
<b>Total Credit</b>						<b>25</b>

**Faculty of Engineering & Technology**  
**Department of Civil Engineering**

**Diploma (Civil Engg.)**

**V Semester**

**TEACHING & EXAMINATION SCHEME**

Sr. No	Paper Code	Subject	Credit (L-T-P)			Total Credit
			L	T	P	
1	07CE501	Highway Engineering	4	0		4
2	07CE502	Public Health Engineering	4	0		4
3	07CE503	Quantity Surveying & Costing	4	0		4
4	07CE504	Structural Design & Drafting-I	4	0		4
5	07CE505	Irrigation Engineering	4	0		4
1	07CE551	Highway Engineering Lab			2	1
2	07CE553	Structural Design & Drafting-I Lab			2	1
3	07CE554	Industrial Training				5
4	07CE555	Public Health Engineering			2	1
<b>Total Credit</b>						<b>28</b>

**Faculty of Engineering & Technology**  
**Department of Civil Engineering**

**Diploma (Civil Engg.)**

**VI Semester**

**TEACHING & EXAMINATION SCHEME**

Sr.No	Subject Code	Subject Name	Credit (L-T-P)			Total Credit
			L	T	P	
1	07CE601	Railway & Bridge Engineering	3	1		4
2	07CE602	Structural Design & Drafting-II	3	1		4
3	07CE603	Construction Management	3	1		4
1	07CE651	Computer Aided Drafting (Lab)			4	2
2	07CE652	Structural Design & Drafting-II Lab			2	1
3	07CE653	Project			20	10
Total Credit						25

**Diploma (Engg.)  
Civil Engineering  
Semester-III  
SURVEING-I**

**UNIT I: INTRODUCTION AND SCALES**

Purpose of engineering surveys, Principles of surveying, Various instruments used for length and angular measurements, Plane and geodetic surveying.

**UNIT II: CHAIN & TAPE SURVEY**

Types of chain and tapes Study of 20m and 30 m chain, Accessories in chain surveying, Ranging methods- direct ranging, o indirect/reciprocal ranging, Use of line range, Chaining on plane and sloping ground ,Obstacles in chaining, offsets, Types of offsets, Use of offsets Instruments used to take offsets, ??Recording field book, chain traversing, base line, tie line, check line, and chain triangulation, Errors in chaining, tape and their correction, Symbols and signs to indicate ground features.

**UNIT III: COMPASS SURVEY**

Types of compass prismatic and surveyors compass, Bearing of lines fore bearing and back bearing, Whole circle bearing and reduced bearing systems, Local attraction and its detection, Magnetic declination and dip Calculation of - exterior and interior angle, Closed and open traverse, closing errors, Graphical adjustment of closing error.

**UNIT IV: LEVELING AND CONTOURING**

Meaning of various terms used in leveling, Types of levels and their uses, Dumpy level, tilting level, quick set level, Auto-set level and digital level, Description of dumpy level, Temporary adjustment of level, Fundamental lines of levels and their relationships, Recording level book, Computation of reduced level by H.I. method and rise and fall method

**Methods of leveling:** Simple leveling, fly leveling, differential leveling, reciprocal leveling, Longitudinal and cross sectioning, Computation of missing readings, Errors in leveling.

**Contouring** - Definition of contours, Contour interval, horizontal equivalent, Uses of contours, characteristics of contours, Methods of contouring, direct and indirect method of contouring, Interpolation of contours, plotting of contour, use of Topo sheet.

**UNIT V: PLANE TABLE SURVEY**

Principles of plane table surveying, Plane table and its accessories, setting of plane table, Methods of plane table surveying, Suitability of each method, Plane table survey by radiation Intersection and traversing Advantages and disadvantages of plane table surveying

**SURVEING PRACTICE 1**

**Text Books:**

- 1 Surveying and leveling T.P.Kanetkar Vol.1
- 2 Surveying and leveling Dr. B.C. Punnia

**Reference books:**

- 1 Surveying and leveling Hussain & Nagraj
- 2 Surveying A Arora

## LIST OF EXPERIMENTS

- 1) Measurement of distances with chain & tape on ground with direct or indirect ranging.
- 2) Construction and use of optical square and open cross staff for setting out perpendicular and running a survey line for locating details.
- 3) Measurement of Area by Chain and cross staff survey.
- 4) Use of prismatic compass and observing fore bearing and back bearing.
- 5) Measuring Fore bearing and Back bearing of 5-6 side closed polygon. Identifying stations affected by local attraction and calculation of corrected F.B. & B.B.
- 6) Measuring fore bearing and back bearing for an open traverse (5 to 6 sided). Calculate direct angles between successive lines.
- 7) Use of Dumpy level, temporary adjustments and taking reading on leveling staff.
- 8) Recording readings in field book.
- 9) Differential leveling practice, reduction of level by rise & fall method.
- 10) Use of auto level and taking observation.**

**Diploma (Engg.)  
Civil Engineering  
Semester-III  
MATERIAL TECHNOLOGY**

**Unit I: STONE, AGGREGATE CLAY PRODUCTS**

INTRODUCTION: Importance of material technology,

STONE & AGGREGATE: Classification of rocks –geological (igneous, sedimentary and metamorphic) Properties of good building stones , Methods of quarrying Stone as aggregate for road construction with their various grades as per I.S. Use of aggregate for building work at various stages sources and properties of aggregate and sand ,Important tests of stones and aggregates

CLAY PRODUCTS :bricks, roofing tiles, flooring tiles Method of preparation of bricks , Table moulded and ground moulded bricks, Burning of bricks, Hoffaman’s continuous kiln Properties of good building bricks

**UNIT II : BINDING MATERIALS**

Lime: Lime as binding material, Types of lime :- fat lime, hydraulic lime, quicklime, Properties of lime. Cement: Different ingredients used for manufacturing cement with their percentage Methods of preparation of cement by (i)wet process (ii) dry process Physical & Chemical Properties of Cement Testing of cement such as:- Ordinary port land cement, , Low heat cement, Slag cement Rapid hardening of cement, Sulphate resistant cement ,White & color cement Quick setting cement, Portland Pozzolana cement, Water repellent cement.

**UNIT III: FLOORING**

Different types of floors used in building, Flag stone floor ,Cement concrete floor Mosaic flooring Tile floors ,Ceramic tile floor ,Glazed tiling Wooden floor, Glass floor.

**UNIT IV: TIMBER & PLASTICS**

TIMBER: Difference between wood and timber ,Timber to be used as an engineering material, Growth of timber:- exogenous, endogenous, Defects in timber-knot, twisted fibers, rind gall, Seasoning of timber, Preservation of timber, Plywood, veneers, laminated plywood.

PLASTICS : P.V.C. pipes used as a materials in pipe laying for water supply purposes, irrigation etc. Water tanks, P.V.C. sheets doors and windows

**UNIT V : STEEL AND ALUMINUM PRODUCTS**

STEEL: T section, Angle section, Channel section, I section, Steel sheets used in manufacturing of doors. Aluminium as construction material Different uses of steel and aluminium in building

**UNIT VI : MISCELLANEOUS**

Use of material like glass, rubber, tar, emulsion, bitumen, glass wool, Use of J bolts U hooks, Stoneware pipes, Galvanized iron pipes, Bituminous materials- their content & origin Asphalt, tar, bitumen - their specific uses. Compare their properties, Adhesives - organic & synthetic, Paints & varnishes necessity of its application requirement of good Paint, Porcelain materials, Fire proofing materials , Insulating materials , Accoustic materials, Thermal insulating materials

**Text books:-**

1. Engineering materials S.C. Rangwala
2. Engineering materials Deshpande

**Reference books:-**

1. Engineering materials Ojha
2. Engineering materials Surendra singh
3. Engineering materials Gurcharn singh



## List of Experiments

### **(i) Bricks :**

- \* Field tests for size, shape and soundness
- \* Compressive strength of bricks
- \* Water absorption test for bricks

### **(ii) Course aggregates :**

- \* Abrasion test on aggregate
- \* Impact test on aggregate

### **(iii) Fine aggregates :**

- \* Sieve analysis of aggregate and Grading of sand
- \* Bulking of sand, silt and clay content

### **(iv) Steel :**

- \* Tensile strength of M.S bar
- \* Tensile strength of H.T.steel

### **(v) Cement :**

- \* Initial setting time of cement
- \* Soundness test of cement

**Diploma (Engg.)  
Civil Engineering  
Semester-III  
HYDRAULICS**

**Unit I: INTRODUCTION OF HYDRAULICS**

INTRODUCTION: Definition of liquid, Ideal liquid and Real liquid, Mass density Specific weight , Compressibility, Viscosity, Surface tension, Branches of hydraulics- Hydro statics, hydro kinematics and hydrodynamics, S.I. units Used in Hydraulics,SCOPE

**UNIT II: LIQUID PRESSURE AND ITS MEASUREMENT**

Various Types of Pressure Such as: Atmospheric Pressure-Gauge Pressure-Absolute Pressure,Vacuum Pressure-Separation Pressure Measurement of Pressure. Various types of pressure such as Atmospheric pressure, Gauge pressureAbsolute pressure,Vacuum pressure -- separation pressure Measurement of pressure,Measurement of light pressure by Pizometer tube, Measurement of moderate pressure by "U" tube manometer, (Positive and Negative pressure) ,Measurement of Gauge pressure and Vacuum pressure,Measurement of difference pressure using "U" tube Manometer,and inverted "U" tube Manometer

**UNIT III: HYDROSTATIC PRESSURE**

Free liquid surface, Definition of pressure and its SI unit, Hydrostatic pressure at point, Pascal's law, Variation of pressure in horizontal and vertical direction in static liquid, Pressure diagram. Total hydrostatic pressure and center of pressure, Determination of total pressure & center of pressure on vertical & inclined faces of dams, sluice gates, sides and bottom of water tanks. Numerical Problems

**UNIT IV: FLOW THROUGH PIPES**

Characteristics of Pipe Flow, Law of liquid friction for laminar flow and turbulent flow, Expression for head loss in pipes due to friction Darcy's weish bach equation. Major losses. Expressions for loss due to sudden enlargement, bends, minor losses Flow through long pipe. Discharge in open and discharge in another reservoir Pipes in series or compound pipe. Pipes in parallel Hydraulic grade lines Energy grade lines in various cases like venturimeter, sudden expansion, and convergent pipe, piping connection of two reservoirs having different water levels. Compound pipes connecting two reservoirs.Pipes connected in parallel equivalent siphon system

**UNIT V: FLOW THROUGH OPEN CHANNELS**

Comparison between - Pipe flow and open channel flow - Uniform flow and non uniform flow N Wetted perimeter. Hydraulic mean depth Hydraulic gradient Chezy's formula Manning's formula Most economical section for rectangular and trapezoidal flow

**UNIT VI: PUMPS**

Definition, understanding and description of centrifugal pump, Its components and working principles Priming Layout selection criteria and situations where used Power requirement computations for centrifugal pump for given discharge and head. Reciprocating pumps - definition, description, component, working principles and situation where used Selection of pumps Submersible pump

**TEXT BOOKS:-**

1. A Text Book of Hydraulics, R.S.Khurmi.
2. A Text Book of Fluids Mechanics Hydraulics Machines, R.K.Rajput,

#### **REFERENCE BOOKS:-**

1. Hydraulics and Hydraulics machines Shri K.D.Saxena
2. Hydraulics and Hydraulic machines Dr. J.Lal
3. Fluid Mechanics and machinery Dr. A.K.Jain
4. Hydraulic K.K.Jain

#### **LIST OF PRACTICALS**

1. Pressure measurement at a point. To measure difference of pressure between two given points by U tube manometer and differential manometer.
2. Determination of Hydraulic coefficients  $C_c$  ,  $C_v$  and  $C_d$
3. Determine discharge through venturimeter.
4. Determine discharge through orifice meter.
5. Plotting hydraulic gradient line and total energy line.
6. Verification of Bernoulli's theorem.
7. Determine time of emptying tank
8. Determine friction losses through pipes
9. Determine losses in pipe due to sudden enlargement and sudden contraction
10. Determine discharge through open channel
11. Study the working of
  - a. Reciprocating pump
  - b. Centrifugal pump
  - c. Submersible pump

**Diploma (Engg.)  
Civil Engineering  
Semester-III  
CIVIL ENGINEERING DRAWING**

**Unit I: INTRODUCTION**

Various types of drawings- Importance and situations where above drawings are required. Types Of Projections;- First angle and Third angle projection, Symbols, conversions, and abbreviations commonly used in building drawing, Scales used for various types of drawings, Titles, margins, as per I. S, sizes of various standard drawing sheets

BUILDING BYE LAWS:- Building bye-laws for residential buildings, Industrial and commercial buildings.

**UNIT II: PRINCIPLES OF PLANNING**

Principles of planning of residential building for Room dimensions, Area, Heights, Privacy, Ventilation, Access, Circulation Economy - Drainage aspect Prospect Orientation - Grouping Principles of planning for school, hospital, post office, shopping centre, office building, industrial unit.

**UNIT III: DETAILS AND MODIFICATION OF BUILDING DRAWING**

Site plan ,Line plan , Detailed plan ,Elevations ,Sections ,Foundation plan , Layout plan ,Showing drainage septic tank water supplies and electricity, Addition and alterations to be incorporated in existing plan, safety aspects

**UNIT IV: DOORS WINDOWS AND STAIR CASE**

Types of doors and windows according to materials, Types of doors and window according to the nature of their construction, Detailed drawing of paneled door and window, Sketches of all types of doors and windows.

Importance of staircase in building, Location of stair case, Types of stair case used in building i.e. straight flight, dog legged, open well stair case

**UNIT V: ROOF TRUSSES AND PIPE CULVERT**

Types of pitched roofs, Timber truss, King post & queen post truss Various members used in pitched roof like tie beam, principal rafter, ridge, eaves board , common rafter, purlin, batten, Roof covering materials tiles, A. C. sheets, G.I. sheets. Box & pipe culvert, Component parts, Detailed working drawing plan, elevation section

**Text Books :**

- 1 Civil Engg. Drawing S.C. Rangwala
- 2 Civil Engg. Drawing Shah , Kale and Patki
3. Civil Engg. Drawing D.K. Ghose

### **LIST OF DRAWING TUTORIALS:**

Recommended plates to

Building drawing

- Plan
- Elevation
- Sections of one bed room and two bed room, residential building (2 sheets)
- Plan, elevation and sections of a double storyed residential building (2 sheets)
- Preparation of detailed plan
- Elevation section of a public building (such as school, hospital, shopping centre etc.) referring to the given plan (3 sheets)

One plate on straight flight and open well, one plate for dog legged stair case

One sheet for timber truss including king post and queen post

One sheet for steel truss

One sheet for lean to roof with roof covering material used like tiles, half round tiles, G.I. sheets

A.C. sheets

Building services and their connections- one sheet, showing layout plan for water supply and sanitary arrangements One sheet showing layout plan for electricity connections Modification of existing building one sheet.

**Diploma (Engg.)  
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Semester-III**

**BASIC ELECTRICAL AND ELECTRONICS**

**UNIT-I: FUNDAMENTALS OF ELECTRICAL ENGINEERING**

Concept of electric current, potential and potential difference (Voltage). Sources of D.C. and A.C. Electric energy. Methods of voltage generation and standard voltages used in generation transmission and distribution. Electrical Power, energy and their units.

**D.C. CIRCUITS:** Ohm's Law, Concept of resistance, conductance, resistivity, conductivity and their units. Effect of temp. on resistance. Temperature coefficient of resistance ( Definition only) Connections of resistances. Series, Parallel connections and their combinations. ( Simple Numericals ) Kirchoff's Voltage Law, Kirchoff's Current Law ( Simple Numerical)

**A.C. CIRCUITS:** Generation of single phase and three phase sinusoidal voltage. Vector representation. Concept of Cycle, Frequency, time period, amplitude, phase and phase difference. Define instantaneous value, average value, RMS value and peak value of sinusoidal electrical quantities. Derive relationship between them . Form factor and peak factor ( Definition only). Current voltage and power in pure resistive, inductive and capacitive circuit. Concept of Reactance , impedance and power factor in R.L., R. C. and RLC Series circuit. ( Simple Numericals). Causes and effect of poor power factor. Methods of improving power factor. 3 phase AC supply- three phase three wire and three phase four wire system. Relationship between  $V_L$  and  $V_{PH}$ ,  $I_L$  and  $I_{PH}$  and three phase power in star and delta connected load.( Simple Numerical)

**UNIT-II: A.C. MACHINES**

Single Phase Transformer : Construction, working principle. EMF Equation (Derivation with simple numerical), Turn ratio, Step up and step down transformers and their application. Losses , efficiency and regulation ( No derivation). Three Phase Induction Motor : Construction, types , principle of operation. Concept of Slip ( Simple Numerical), Applications, Starters: DOL and Star Delta. Single Phase Induction Motor : Methods of making a single phase motor self start. Types of single phase induction motor- capacitor start, capacitor run and shaded pole and their applications. Synchronous Machines : Synchronous motor- construction, principle of operation, comparison with three phase induction motor. Synchronous generator ( alternator) – Construction, principle of operation, speed and frequency, synchronous speed.

**UNIT-III: MEASURING INSTRUMENTS**

Classification of Measuring Instruments, absolute and secondary instruments. Indicating, Integrating and Recording instruments, their examples. Elementary idea about working principles and construction of MI and MC type Ammeter and voltmeter. Electrodynamometer type watt meter. Induction type energy meter , electronic energy meter. Application of Megger and earth tester. Multimeter,

**UNIT-IV: ELECTRIC WIRING**

Types of Wiring and their Applications in brief. Size of conductor , S.W. gauge. Accessories like switches, fuses, holders, sockets and MCB's. Staircase Wiring , Fluorescent tube light wiring .

## **ELECTRIC SAFETY**

Electric shock and its prevention , effect of electrical current on human body, shock treatment, need of earthing.

## **UNIT-V : ELECTRONIC DEVICES AND CIRCUITS**

Semiconductor PN Junction Diode, Zener Diode, PNP and NPN transistor , UJT, FET, MOSFET and SCR. Their layer diagram, symbol, V-I characteristics and applications. Electronic Circuits : Concept of biasing of diode and transistor. Single Phase Half wave and Full wave rectifier( I/O waveform), Concept of ripple, filter circuit ( shunt capacitor and series inductor) . Transistor as an amplifier, concept of gain, Zener regulator, regulated power supply ( Block diagram only).

## **REFERENCES**

1. Fundamental of Electrical Engineering and Electronics – B.L. Thareja , S. CHAND Publication
2. Basic Electrical Engineering – V.K. Mehta , S. CHAND Publication
3. Principles of Electronics – V.K. Mehta , S. CHAND Publication
4. Basic Electrical Engineering – V. N. Mittle, TMH
5. Electrical Machines Vol I & II – S.K.Bhattacharya, TTTI, Chandigarh
6. A Curse book in Electrical & Electronic Measurement and Instrumentation , A.K Sawhney.
7. Principles of Electrical Engg. and Electronics – V.K. Mehta , S. CHAND Publication
8. Electrical Technology – S.L.Uppal, Khanna Publication
9. ELectrical Measurement – J.B. Gupta, Dhanpat Rai & Sons.

## **LIST OF EXPERIMENTS**

1. Verification of Kirchoff's Law
2. To Measure Voltage Current and power in single phase AC circuit.
3. To calculate Impedance, power and power factor by measuring voltage across each element
4. Study of different parts of DC machine . Study of three point starter for DC motor.
5. Study of different parts of Induction Motor (Single Phase/ Three Phase)
6. To determine transformation ratio of a given single phase transformer. Study and operation of DOL and Star Delta Starter.
7. To measure slip for a given three phase induction motor.
8. To measure insulation resistance by Megger.
9. To measure earth resistance by earth tester.
10. To make connection for fluorescent tube light circuit.

**Diploma (Engg.)  
Civil Engineering  
Semester-IV**

**BUILDING CONSTRUCTION TECHNOLOGY**

**Unit -1 : Building components and types of structure**

Building components & their function. Substructure – foundation, plinth. Superstructure – walls, sill, lintel, doors & windows, Floor, roof, parapet, beams, columns.

Types of structures – load bearing structures, framed Structures, composite structures.

**Masonry materials**

A) building stones- classification of rocks, requirement of good Building stone, dressing of stones, quarrying of stones ,artificial or cast Stones

B) bricks– conventional bricks , standard bricks composition of clay Brick, strength of bricks, proportions of burnt clay bricks , testing of Bricks , special bricks ,hollow blocks , fly ash bricks.

C) mortars – classifications, lime mortar, cement mortar, special Mortars. Functions of mortar, proportions, properties of mortar and Tests for mortar.

**Timber based material**

Use of timber, characteristics of good timber, defects in timber, Plywood, particle board ,vener, sun mica , fore mica, nuwood, artificial Timber, rubber wood.

**Miscellaneous materials**

Glass, plastic, fibers, aluminum, steel , galvanized iron, asphalt bitumen Etc .micro silica, pvc, cpvc, ppf. Waterproofing and termite proofing materials, admixtures in concrete, Bonding agents, epoxy resins, polishing materials etc

**Unit-2: Construction of substructure**

**Job layout**

Site clearance, preparing job layout, layout for load bearing structure And framed structure by center line and face line method, precautions While marking layout on ground .

**Earthwork**

Excavation for foundation, timbering and strutting earthwork for Embankment material for plinth filling. Tools and plants used for Excavation and earthwork.

**Foundation**

Types of foundation – open foundations, shallow foundation, stepped Foundation, isolated and combined column footing, raft foundation, Deep foundation and pile foundation. Pumping method of dewatering, cofferdams. Bearing capacity of foundation soil, under reamed pile foundation.

**Unit-3: Construction of superstructure**

**Stone masonry**

Terms used in stone masonry – facing, backing, hearting, through stone, Corner stone.

Uncoursed rubble masonry, coursed rubble masonry, point to be Observed in construction of stone masonry, mortars for stone masonry, Tools and plants used for stone masonry, col-grout masonry.

**Brick masonry**

Common terms used in brick masonry, requirements of good brickwork, Bonds in brick masonry, english, flemish, stretcher and header bonds Only. Brick laying ,line level and plumb of brickwork, striking and raking of Joints, lead and lift, precautions in brick masonry, tools and



plants used In brick masonry . Comparison between brick and stone masonry. Hollow concrete block Masonry, composite masonry , Cavity wall- purpose and construction.

### **Doors and windows**

Doors -components and construction of panelled doors, battened Doors, flush doors, collapsible doors, rolling shutters, revolving Doors, glazed doors. Sizes of door. Windows -component and construction of fully panelled, partly Panelled and glazed, glazed wooden, steel, aluminum windows,

Sliding windows, louvered window, ventilators, cement grills. Protective treatment for doors and windows, fixtures and Fastenings for doors and window. Sill, lintel and weather shed - functions, types and construction .

### **Vertical communication**

Means of vertical communication – stair case, elevator or Of good staircase, types of staircase, fabricated stair.

### **Scaffolding and shoring**

Purpose, types of scaffolding, process of erection and dismantling. Purpose and types of shoring, underpinning, safety precautions.

### **Unit-4: Building Finishes,Floors and Roofs:**

Floor finishes- shahabad , kota, marble, granite ,kadappa, ceramic tiles ,vitrified , mosaic tiles ,chequered tiles, glazed tiles ,pavement blocks , Concrete floors, tremix floor, skirting and dado.

Process of laying- process of laying and construction, finishing and Polishing of floors.

Roofing materials – ac sheets ,g.i. Sheets, plastic sheets, fibre Sheets, mangalore tiles etc. Steel trusses. R.c.c. Slab

### **Wall finishes**

Plastering – necessity of plastering, single coat plaster double coat Plaster , neeru finishing and pop, special plasters stucco plaster , Plaster board and wall claddings. Precaution to be taken while Plastering. Defects in plaster. Pointing – necessity and procedure of pointing. Painting – necessity, surface preparation, method of application, Selecting suitable painting material, white wash and colour wash.

### **Unit-5: Building maintenance**

#### **Cracks**

Causes and types of cracks, identification and repair of cracks. Guniting And grouting, use of epoxy and crack fills.

#### **Settlement**

Settlement --causes and remedial measures Plinth protection – necessity and materials used.

#### **Demolition**

Necessity, method of demolition-hand demolition, machine demolition, Controlled blasting demolition, precautions during demolition.

**Rebaring techniques** Necessity and equipment for rebaring techniques

### **Text books:-**

- 1) Building construction B.C. Punmia laxmi publication

### **Reference books:**

- 2) construction materials d.n. Ghose tata mcgraw-hill

- 3) Building materials amarjit agrawal new india publication
- 4) Building materials s. K. Duggal new age international

**List of practical's:**

1. Preparing foundation plan and marking on ground layout of load bearing structure by face line Method from the given plan of the building.
  2. Preparing foundations plan and marking on ground layout of framed structure by face line method From the given plan of the building.
  3. Checking and transferring line and level of plinth, sill, lintel, flooring, slab level of a building and Writing report of the process.
  4. Checking verticality (plumb line) of formwork for column, beam and wall at construction site and Writing report of the process.
  5. Laying and constructing the process of construction of brickwork and report writing of the Process.
  6. Observing the process of painting in residential / public building and writing a report with Reference to process and type of paint selected.
  7. Observing and writing report of the process of plastering.
  8. Observing and writing report of the process of water proofing of terrace or basement.
- Observing the models, specimen of building materials kept in the model room for few building items and Writing a report for any five models/materials.

**Diploma (Engg.)  
Civil Engineering  
Semester-IV**

**CONCRETE TECHNOLOGY**

**Unit I**

**Introduction:-** Definition of concrete. Brief introduction to properties of concrete. Advantages of concrete. Uses of concrete in comparison to other building materials.

**Introduction to Ingredients of Concrete:** Cement, Aggregates and Water

**Unit II**

**Water Cement Ratio:-** Hydration of cement, Effect of various W/C ratios on the physical structure of hydrated cement, water cement ratio law and conditions under which the law is valid; internal moisture, temperature, age, and size of specimen. Definition of cube strength of concrete. Relations between water cement ratio and strength of concrete. Use of CBRI chart.

**Workability:** Definition, of workability. Concept of: Internal friction,, Segregation, Harshness. Factors affecting workability; water content, shape, size and percentage of fineness passing 300 mic.

**Unit III**

**Proportioning for Ordinary Concrete:** Object of mix design, Strength required for various grades as per IS 456, Preliminary test, Works cube test. Proportioning for ordinary mix as prescribed by IS and its interpretation. Adjustment on site

for: Bulking, water content, Absorption, Workability Design data for moisture, bulk age, absorption and suitable fine aggregate and coarse aggregate ratio. Difference between ordinary and controlled concrete.

**Unit IV**

**Concrete Operations:-**

- 1) Storing Cement & Aggregate
- 2) Batching
- 3) Mixing
- 4) Transportation of Concrete
- 5) Placement of Concrete
- 6) Compaction:
- 7) Finishing concrete slabs-screeding, floating, and trowelling.
- 8) Curing
- 9) Jointing

## Unit V

### Properties of Concrete:

- (i) Properties in plastic stage
- (ii) Properties of hardened concrete
- (iii) Admixture (uses and effect)

**Quality Control at Site:-** Control tests on cement, aggregate water and concrete. Concept of quality control. Hot Weather Concreting, Cold Weather Concreting, Repair and Maintenance, Special types of concrete:-

### Text Books:-

1. Neville A.M., *Concrete Technology*, Standard Publishers Distributors, Delhi.
2. Kulkarni P.D., *Textbook of Concrete Technology*, New Age International Publishers, Delhi.
3. Santhakumar A.R., *Concrete Technology*, Oxford University Press, Mumbai.

### Reference Books:-

1. Ramachandran V.S., *Concrete Admixtures Handbook*, Standard Publishers Distributors, Delhi.

## CONCRETE TECHNOLOGY LAB

- (i) To determine flakiness index and elongation index of coarse aggregate (ISI:2386-pt.1-1963)
- (ii) Field method to determine fine silt in aggregate.
- (iii) Determination of specific gravity and water absorption of aggregates (IS:2386 Part-III-1963) (for aggregates 40mm to 10mm)
- (iv) Determination of bulk density and voids of aggregates (IS:2386-Part-III-1963)
- (v) Determination of surface moisture in fine aggregate by displacement method (IS:2383-Part-III-1963)
- (vi) To determine necessary adjustment for bulking of fine aggregate by field method (IS:2383-Part-III-1983).
- (vii) Test for workability (slump test);
  - (a) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/cement ratio on slump.
  - (b) To test cube strength of concrete with varying water cement ratio.
- (viii) Compacting factor test for workability (IS:1199-1959)  
Workability of concrete by Vee-Bee consist meter.
- (ix) Fineness modulus of sand.

**Diploma (Engg.)  
Civil Engineering  
Semester-IV**

**SOIL MECHANICS**

**Unit-1: Introduction:**

Definition of Soil Importance of soil in Civil Engineering as construction material in Civil Engineering Structures, as foundation bed for structures Field application of geotechnical engineering foundation design, pavement design, design of earth retaining structures, design of earthen dams (brief ideas only) Physical Properties of Soil Soil as a three phase system Water content, Determination of water content by oven drying method as per IS code Void ratio, porosity and degree of saturation, density index Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight Determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code Specific gravity, determination of specific gravity by pycnometer. Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index. Determination of liquid limit, plastic limit and shrinkage limit as per IS code. Particle size distribution, mechanical sieve analysis as per IS code particle size distribution curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils. Particle size classification of soils & IS classification of soil

**Unit-2: Permeability of Soil & Seepage Analysis**

Definition of permeability Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil Factors affecting permeability Determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines. Flow net, characteristics of flow net, application of flow net (no numerical problems)

**Unit-3: Shear Strength of Soil**

Shear failure of soil, field situation of shear failure Concept of shear strength of soil Components of shearing resistance of soil – cohesion, internal friction Mohr-coulomb failure theory, Strength envelope, strength equation Purely cohesive and cohesion less soils Laboratory determination of shear strength of soil – Direct shear test, Unconfined compression test & vane shear test, plotting strength envelope, determining shear strength parameters of soil

**Bearing Capacity of Soils**

Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure Terzaghi's analysis and assumptions made. Effect of water table on bearing capacity Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888 & IS:2131 Typical values of bearing capacity from building code IS:1904 Definition of active earth pressure and passive earth pressure, structures subjected to earth pressure in the field

#### **UNIT-4: Compaction of Soil & Stabilization**

Concept of compaction, purpose of compaction field situations where compaction is required. Standard proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line. Modified proctor test Factors affecting compaction Field methods of compaction – rolling, ramming & vibration and Suitability of various compaction equipments. California bearing ratio, CBR test, significance of CBR value Difference between compaction and consolidation Concept of soil stabilization, necessity of soil stabilization Different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization

#### **UNIT-5: Site Investigation And Sub Soil Exploration**

Necessity of site investigation & sub-soil exploration. Types of exploration – general , detailed.

Method of site exploration open excavation & boring Criteria for deciding the location and number of test pits and bores Disturbed & undisturbed soil samples for lab testing. Field identification of soil – dry strength test, dilatancy test & toughness test Empirical correlation between soil properties and SPT values.

#### **List of Practical**

1. Determination of water content of given soil sample by oven drying method as per IS Code.
2. Determination of bulk unit weight dry unit weight of soil in field by core cutter method as per IS Code.
- 3 Determination of bulk unit weight dry unit weight of soil in field by sand replacement method as per IS Code.
4. Determination of Liquid limit & Plastic limit of given soil sample as per IS Code.
- 5 Determination of grain size distribution of given soil sample by mechanical sieve analysis as per IS Code.
6. Determination of coefficient of permeability by constant head test
7. Determination of shear strength of soil using direct shear test.
8. Determination of shear strength of soil using Laboratory Vane shear test
9. Determination of MDD & OMC by standard proctor test on given soil samples as per IS Code.
10. Determination of CBR value of given soil sample.
11. Determination of shear strength of soil using unconfined compressive strength.
12. Determination of shear strength of soil using tri-axial shear test.

#### **Text Books:-**

- 1) Dr. B. C. Punmia Soil Mechanics & Foundation Engineering Standard Book house, New Delhi

#### **Reference books:**

- 1) Murthi Soil Mechanics &
- 2) Foundation Engineering Tata McGraw Hill , New Delhi
- 3) B. J. Kasmalkar Soil Mechanics Pune Vidhyarti Griha, Pune
- 4) Gulhati & Dutta Geo-technical
- 5) Engineering Tata McGraw Hill , New Delhi

**Diploma (Engg.)  
Civil Engineering  
Semester-IV**

**MECHANICS OF STRUCTURES**

**UNIT-1: Stress & Strain**

- 1.1 Definition of rigid body, plastic body, mechanical properties of metal such as elasticity & elastic limit.
- 1.2 Definition of stress, strain, modulus of elasticity, S. I. Unit. Classification of stress, strain, Sign convention. Stress, strain curve for mild steel and HYSD bar, yield stress/ proof stress, Ultimate stress, breaking stress and percentage elongation.
- 1.3 Deformation of body due to axial load. Deformation of a Body subjected to axial forces. Deformation of body of stepped c/s due to axial load, max. stress and min. stress induced. Stresses in bars of composite section & deformation.
- 1.4 Shear stress, shear strain & modulus of rigidity, complementary shear stress, state of simple shear, punching shear. Elastic Constants & Principal Stresses

**UNIT-2**

- 2.1 Definition of lateral strain, Poisson's ratio, Change in lateral dimensions
- 2.2 Volumetric strain due to uni-axial force and change in volume
- 2.3 Biaxial and tri-axial stresses and volumetric strain & change in volume
- 2.4 Definition of bulk modulus, volumetric strain.
- 2.5 Relation between modulus of elasticity, modulus of rigidity and bulk modulus.
- 2.6 Definition of principal planes & principal stresses
- 2.7 Principal planes & stress due to bi-axial stress system & due to state of simple shear. (Analytical method only)

**UNIT-3: Shear Force And Bending Moment**

- 3.1 Types of beams - cantilever, simply supported, fixed and continuous beams, types of loading- point load, uniformly distributed load, support reactions for determinate structures
- 3.2 Concept of shear force and bending moment, sign convention. Relation between bending moment, force and rate of loading
- 3.3 Shear force and bending moment diagrams for simply supported beams, overhanging beams and cantilever subjected to point loads, UDL and couples, point of contra flexure

**UNIT-4: Moment Of Inertia**

- 4.1 Concept of moment of inertia M.I of plane areas such as rectangle, triangle, circle, semicircle and quarter circle
- 4.2 Parallel axis and perpendicular axis theorem M.I of composite, built up sections, symmetrical and unsymmetrical sections, radius of gyration & polar moment of inertia.

**UNIT-5: Stresses In Beams**

- 5.1 Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, bending stresses and their nature, bending stress distribution diagram, moment of resistance.

5.2 Application of theory of bending to symmetrical and unsymmetrical sections.

5.3 Shear stresses in beams: Shear stress equation, meaning of terms in equation, shear stress distribution for rectangular, hollow rectangular, circular sections and hollow circular sections

5.4 Relation between max. shear stress and average shear stress.

### **Analysis of Trusses**

Definition frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumption in analysis. Method of joint, method of section and graphical method to find nature of forces.

### **Strain Energy**

Types of loading – gradual, suddenly applied load & Impact load ,Definition of strain energy, modulus of resilience and proof resilience.Comparison of stresses due to gradual load, sudden load and impact load.

### **Text Books:-**

- 1) R. S. Khurmi Strength of Materials S. Chand & Company Delhi

### **Reference Books:**

- 1) F. L. Singer Strength of Materials Harpe Collins Publishers India ,Delhi
- 2) S. B. Junnarkar Mechanics of Structures volume –I & II Charotar Publishing House, An

### **List of Practicals:**

1. Identify the components of universal testing machine & tension test on mild steel.
2. Tension test on tor steel / deformed bars .
3. Izod Impact test on mild steel, brass, copper and cast iron.
4. Charpy impact test on mild steel, brass, copper and cast iron.
5. Flexural test on timber.
6. Flexure test on floor tiles or roofing tiles.
7. Shear Test on metal.
8. Water Absorption & Compression test (Dry & Wet) on bricks
9. Abrasion Test on flooring tiles.
10. Drawing of Shear force and Bending Moment diagrams on Graph Paper
11. Graphical Solution of Two Problems on simple frames i) Cantilever ii) Simply supported on A2 size sheet with their analytical solutions



**Diploma (Engg.)  
Civil Engineering  
Semester-IV**

**SURVEYING – II**

**Unit-1: Curves**

Types of curves used in road and railway alignments. Notations of simple circular curve. Designation of curve by radius and degree of curves. Method of Setting out curve by offset from Long chord method and Rankine's method of deflection angles. Simple Numerical problems on above topics.

**Unit -2: Advanced Survey Equipments**

Construction and use of one Electronic Digital Theodolite. Features of Electronic Theodolite, Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M.Total station

**Unit -3**

**Global Positioning System-** Introduction, Working Principle, Technical Terms and Constructional features of GPS.

**Unit-4: Aerial Survey and Remote Sensing**

Aerial Survey Introductions, definition, Aerial photograph. Remote Sensing – Introduction, Electro-Magnetic Energy , Remote sensing system- Passive system , Active system. Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system.

**Unit-5: Geographical Information system(GIS)**

Introduction, Difference between image processing system and geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, applications of GIS in Civil engineering.

**Text Books:-**

- 1) Surveying by B. C. Punmia
- 2) Surveying by K. R. Arora , 1. Vol. I & II, Standard Book House, Delhi.

**Reference Books:-**

- 1) Punmia B.C., Surveying Vol. I & II, Laxmi Publications (P) Ltd. New Delhi.
- 2) Guggal S.K., Surveying Vol. I & II, New Age International Publishers New Delhi.
- 3) Chandra A.M., Surveying Problem Solving with Theory & Objective Type Questions, New Age International Publishers New Delhi.
- 4) Remote Sensing and Image Interpretation : T.M. Lillensand and R.W. Keifer
- 5) Principles of Remote Sensing : P.J. Curren
- 6) Geographical Information systems- A Management Perspective : Stan Aromoff

**List of Practicals:**

- 1) Setting out a Simple Circular Curve with given data by the Offsets from main chord method
- 2) Setting out a Simple Circular Curve with given data by the Offsets from the chords produced.
- 3) Setting out a Simple Circular Curve with given data by the One Theodolite method.
- 4) Setting out a circular curve with transition length by linear measurements.
- 5) Study on GPS System
- 6) Study on Total Station
- 7) Experiment based on GPS System
- 8) Determination of Horizontal and vertical angle by Theodolite
- 9) Study on GIS and Remote Sensing
- 10) To Study the different types of Toposheet.

**Diploma (Engg.)  
Civil Engineering  
Semester-V**

**Highway Engineering**

**UNIT I: INTRODUCTION**

Role of roads in national development, Classification of roads as per Indian Roads Congress, Road Development plans of India, Road patterns, Reconnaissance survey, Map-study and preliminary survey, Detailed survey, various drawings and reports.

**UNIT II: ROAD GEOMETRICS**

Cross section of various types of roads as per I.R.C. design criterion, road margins, Gradient and its standard values, Camber and its standard values, Super elevation, Radius and degree of curve, Widening of roads, Mechanical & Psychological widening, Sight distance, Stopping sight distance, Overtaking sight distance, Simple circular curves and Transition curves- their function and purpose, Vertical curves. Numerical.

**UNIT III: PAVEMENT DESIGN MATERIALS & CONSTRUCTION**

Pavement types – Rigid and flexible, Road materials and their qualities, Design factors for various types of pavements, CBR value, Various tests of materials, Construction of earth roads, Gravel roads, WBM Roads, Bituminous pavements, Cement concrete pavements and joints in cement concrete pavements, earthwork in cutting and filling.

**UNIT IV: TRAFFIC ENGINEERING**

Traffic characteristics, Traffic surveys, Traffic accidents- causes and preventive measures, Traffic Rotary, Traffic signals & their classification

**UNIT V: ROAD MAINTENANCE**

Pavements failures, causes and repairs, Defects in cement concrete roads, causes of defects, Repairing measures, Strengthening of existing pavements.

**Reference Books :**

1. Highway Engg. S.K.Khanna & C.E.G. Justo
2. Highway Engg. N.K. Vashwani
3. Highway Engg. S.B. Sehgal
4. Principles & Practice of Highway Engg. L.R. Kadiyali
5. A course in Highway Engg. S.P. Bindra

**LIST OF PRACTICALS/TUTORIALS:**

1. To determine Grading of coarse aggregate
2. To determine Impact value of given aggregate
3. To determine Crushing value of given aggregate
4. To determine Abrasion value of given aggregate
5. To determine Specific gravity of given aggregate
6. To determine Flakiness and Elongation index of given aggregate
7. To determine Penetration value of Bitumen/Tar
8. To determine Ductility test of Bitumen/Tar
9. To determine Flash and Fire point of Bitumen/Tar
10. To determine Softening point of Bitumen/Tar

**Diploma (Engg.)  
Civil Engineering  
Semester-V**

**Public Health Engineering**

**UNIT I: INTRODUCTION**

Hydrological cycles, Duties of Public Health Engineer, Types of sources - surface water, ground water, open well, tube well, infiltration well, infiltration gallery, Yield of well, Population forecast by Arithmetic Progression method, Geometric Progression method and incremental method, Factors influencing demand rate, Variations in demand, Fire demand, Total water demand of a city.

**UNIT II: QUALITY OF WATER & TREATMENT PROCESS**

Effects of different impurities (physical, chemical & bacteriological) on water, Water borne diseases, Standards of potable water, Treatment of water, Sedimentation, Coagulation, Flocculation, Filters- slow sand, rapid, gravity and pressure filter, Disinfection.

**UNIT III: DISTRIBUTION SYSTEM**

Intakes – Functions, river, canal, reservoir and lake intakes. Types of Pumps, working principle and their working.

Type of pipes and their comparison, G.I. pipe, PVC pipes, pipe joints.

Distribution System - Types, Functions, Components, service reservoir, Valves-slucie valve, Reflux valve, Service connection.

**UNIT IV: SANITATION & SEWERAGE**

Waste water and domestic sewage, Conservancy and water carriage system, Disposal of garbage.

Functions and types of sewer, Sewer laying, Ventilation of sewer.

Sewer appurtenances, catch pit, Oil grease trap, Grit chamber, Flushing tank, Siphon spillway, Ventilation shaft.

Sources of sewage, Factors affecting quantity of sewage, Sewage strength.

Sewage Treatment Processes, Functions of screen and grit chambers, Rectangular and circular settling tanks, Trickling filter, Flow diagram of treatment plant, . Disposal of liquid effluent.

**UNIT V: HOUSE WATER SUPPLY AND SANITATION**

Water supply and sanitary fittings, Water Closets and its types, Gully trap, Fresh air intake, Ventilating cowl, Water seal, Trap, anti-siphonage pipe, Inspection chamber, Intercepting chamber, Disposal of garbage, Sullage and night soil, septic tank.

**Reference Books :**

1. Textbook of water supply and sanitary engg. Hu-saon,S.K.,Oxford and IBH publishing Co., New Delhi.
2. Textbook of water supply and sanitary engg. JS Birdie, Dhanpat rai & sons, Delhi.

**Diploma (Engg.)  
Civil Engineering  
Semester-V**

**Quantity Surveying & Costing**

**UNIT I: INTRODUCTION**

Purpose of estimate and its importance, Approximate method or Stage-I estimate, Service unit method, Plinth area method, Cubic content method. Types of estimate.

**UNIT II: TAKING OUT QUANTITIES**

Units of measurements, different items of work required in estimating building works, Accuracy in measurement and calculating quantities by long and short wall method, Centerline method.

Standard conversion used in measurements,

Use of Schedule of Rates, Information available in schedule of rates with specialization of particular item such as Labour rates, Material rates, Transportation rates

**UNIT III: ANALYSIS OF RATES**

Purpose of rate analysis, Task artisan per day, Materials required for major items, Labour required for major items, Analysis of major items of work.

**UNIT IV: DETAILED ESTIMATE OF BUILDINGS**

Pre-requisite for stage-II estimate or detailed estimate, Preparation of abstract from quantity sheets, Percentage provision to be made in stage II estimate for some items.

Classification of estimates, Original work, Special repair work, Addition/Alteration work, Revised estimate, Annual repairs, Final estimate.

**UNIT V: EARTHWORK ESTIMATE**

Calculation of area of cross-section for given cross-sections:

- Fully cutting section
- Partly cutting and partly embankment section
- Fully embankment section

Calculation of earth work by using Prismoidal formula, Trapezoidal formula. Lead and lift.

**Reference Books :**

<b>S.No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
1.	Estimating and Costing	B.N. Dutta, S.D. Dutta & Co., Tagore Path, Motilal Bose Road, Lucknow
2.	Estimating, Costing & Valuation	Rangwala,, Charotar Publications, Station Road, Anand
3.	Estimating,& Costing	Birdi, J.C. Kapoor for Dhanpet Rai & Sons, Delhi & Julandhar

4. Estimating & Costing Vol. I & II J.C. Malhotra, Khanna Publishers, 28, Nath Market, Nai Sarak, New Delhi
5. Current Schedule of rates from -  
PWD/PHE/Irrigation

**LIST OF PRACTICALS/TUTORIALS:**

1. Workout the quantities of all items of work for a single storied residential building with flat roof
2. Workout the quantities of all items of work for a single storied residential building with pitched roof
3. Workout the quantities of all items of work for a shop cum residential double storied building
4. Rate analysis for:
  - Brick masonry
  - Excavation in foundation
  - Cement concrete
  - Cement mortar
  - Flooring
  - Woodwork.
5. Estimate of road of 1 K.M. length for following pavement surfaces-
  - W.B.M.
  - Bitumen

**Diploma (Engg.)**  
**Civil Engineering**  
**Semester-V**  
**Structural Design & Drafting-I**

**UNIT I: INTRODUCTION**

S.I. Units, Meaning of R.C.C., Purpose of reinforcement, Steel as a reinforcing material, Types of steel used for reinforcement, Different mixes of concrete to be used for R.C.C. work. Use of I.S: 456-2000 and I.S: 875-1984 for designing R.C.C. structures.

Limit state of collapse, Limit state of serviceability, Characteristic strength of materials, Characteristic load, Partial safety factors, Design values, stress-strain curve for concrete and steel. Assumptions in limit state of collapse for flexure, Stress block parameters, Neutral axis, neutral axis depth, Max. Depth of N A, balanced and under-reinforced section, Design of sections for flexure – singly reinforced rectangular beam, Doubly reinforced rectangular beam

**UNIT II: PROVISIONS FOR DESIGN CONSIDERATION**

Nominal shear stress, Design shear strength of concrete with and without reinforcement, Minimum shear reinforcement, Design of shear reinforcement.

Concept and necessity of development length, Value of design bond stress, Overlap length, Necessity of Hook and bend.

Deflection, Control of deflection, Span by depth ratio, Cracks, limiting width of crack, Control of cracking.

Effective span, Modification factor for Tensile and compressive steel. Vertical and horizontal spacing of reinforcement, Maximum and minimum reinforcement, Minimum positive and negative reinforcement at support, Minimum length of reinforcement inside support.

**UNIT III: DESIGN OF SLABS, BEAMS and STAIRCASE**

Design of one way slab, Design and drafting of one way simply supported slab.

One way continuous slab – design

Two way slab – design and drafting of simply supported slab with corners held down.

Design & Drafting of Singly reinforced Beam and Doubly reinforced Beam.

Flanged Beam- Design & Drafting.

Continuous Beam- Design & Drafting of three span continuous beam.

IS provisions for design of staircase, Effective span and loading for stairs, Design and drafting of straight flight and cantilever stair.

**UNIT IV: COLUMNS and COLUMN FOOTINGS**

Types of column- short and long column, Axially loaded column, columns subjected to bending.

IS provisions for design of column, Ultimate load for axially loaded columns ( $P_u$ ).

Columns with helical reinforcement, Design of axially loaded columns.

IS Code provisions for design of footing, Design and drafting of Isolated footing.

**UNIT V: INTRODUCTION TO WORKING STRESS METHOD and PRE-STRESSED CONCRETE**

Permissible stresses in steel and concrete, Assumptions for design in flexure, Under-reinforced, Over-reinforced and balanced section, Design constants for balanced sections.

Principles of pre-stressing, Methods of pre-stressing, Advantages and disadvantages of prestressing.

**Reference Books :**

<b>S.No.</b>	<b>Title</b>	<b>Author</b>
1.	Limit state theory & design of R.C.C.	Dr. S.R. Karve & Dr. Shah
2.	Design of R.C.C.	H.J. Shah
3.	R.C.C. design	N.C. Sinha
4.	Design of Reinforced Structures	Dr. B.C. Punamia
5.	R.C.C.	Dr. A.K. Jain
6.	IS: 456-2000, 875-1984, 432-Part-I 1786	BIS
7.	Design SP:16 Hand Book	BIS
8.	Hand Book for Limit State Method of Design	V.K. Ghanekar & J.P. Javi

**LIST OF PRACTICALS/TUTORIALS:**

1. Preparation of structural plan for framing of a building showing position of columns and beams.
2. Longitudinal section, cross section of singly reinforced beam with bar bending schedule.
3. Longitudinal section, cross section of doubly reinforced beam.
4. Drafting of R.C.C chajja with lintel.
5. Longitudinal section and sectional plan of one way R.C.C slab with schedule of reinforcement.
6. Longitudinal section and sectional plan of two way R.C.C slab with schedule of reinforcement
7. Longitudinal section, cross section of T-beam and L-beam
8. Preparation of sectional elevation and plan of column and column's footing.
9. Preparation of sectional elevation and plan of Dog-legged and open-well staircase.



**Diploma (Engg.)**  
**Civil Engineering**  
**Semester-V**  
**Irrigation Engineering**

**UNIT I: INTRODUCTION**

Necessity of irrigation, its Importance and Benefits, ill effects of irrigation, Methods of irrigation, Hydrological cycle, Rainfall, Types of rain gauges, Runoff, Flood discharge.

**UNIT II: WATER REQUIREMENTS OF CROPS**

Function of water, Various crops, Crop season, Delta, Duty, Factors affecting Duty, Relation between Duty, Delta and Base period.

**SURVEY FOR IRRIGATION PROJECTS:** Importance of survey, Various types of survey, Reasonability and feasibility of projects.

**UNIT III: STORAGE WORKS**

Types of dams and their suitability, Construction materials, Methods of construction, types of failure of earthen dams and remedial measures.

Gravity Dams- Theoretical and practical profile, typical cross section, drainage gallery.

Spillways- Definition, function, location and components.

**UNIT IV: DIVERSION WORKS**

Weirs – component parts, function and types, its components and their function, canal head regulator, silt excluders and silt ejectors.

Barrages – components and their function. Difference between weir and barrage.

**UNIT V**

**CANAL WORKS**

Components of canal works, Types of canal, Alignment, Design of canal, Canal lining.

**LIFT IRRIGATION SCHEMES**

Importance of lift irrigation, its Suitability, Advantages and limitations of lift irrigation.

Layout of lift irrigation scheme.

**Reference Books :**

<b>S.No.</b>	<b>Title</b>	<b>Author</b>
1.	Irrigation and water power Engineering	B.C. Punmia
2.	Introductory Irrigation Engg.	B.C. Punmia
3.	Fundamental principle of Irrigation Engg.	V.B. Priyani
4.	Fundamental principle of Irrigation Engg.	Bharat Singh
5.	Irrigation Engg. & Hydraulics structures	S.K. Garg
6.	Irrigation Engg.	Birdie
7.	Irrigation Engg.	Gurcharan Singh

**Diploma (Engg.)**  
**Civil Engineering**  
**Semester-VI**  
**Railway & Bridge Engineering**

**Unit I**

**INTRODUCTION:** Brief history of railways, Role of railways in transportation, its advantages, Comparison of railways and highway transportation, Classification of Indian railways, Classification of railway line based on speed criteria, Railway terminology

**PERMANENT WAY:** Permanent way and its components, Requirements of ideal permanent way, Gauges in railway track, Selection of gauges, Uniformity of gauges, Necessity of adopting different gauges, Demerits of adopting different gauges, Railway track cross-sections, Cross section in cutting and filling, Single line double line drainage in railway tracks and yards, Coning of wheels.

**Unit II**

**RAILWAY TRACK:** Ballast, Functions of ballast, requirement of good ballast, different materials used as ballast, size and section of ballast, scissors method of packing ballast, renewal of ballast and quantity required, Sleepers, Functions of sleepers, requirements of good sleeper, types of sleepers, their advantages and disadvantages, comparison, of wooden metal and concrete sleepers, spacing of sleepers and sleeper density, adzing of sleepers, bridge sleepers, stacking of sleepers, Rails, Functions of rails, requirement of rails, types of rail sections, DH BH and FF rails, their standard nomenclature, and comparison, length of rails wear of rails, their causes and remedial measures, rail failures, welding of rail joints, purpose of welding, methods of welding and its advantages, length of welded rails, creep of rails, indications of creep, theories of creep, effects of creep, measurement of creep, prevention of creep.

**Unit III**

**RAIL FIXTURES AND FASTENINGS:** Purpose and types of fixtures and fastenings, fishplates, requirements, sections and failures of fishplates, Spikes, types, uses, characteristics of good spikes, Chairs for BH and DH rails, cast iron chairs, slide chairs, keys, Bearing joints and staggered joints.

**GEOMETRICS:** Necessity of geometric design of a railway track, Degree of curve, Gradient and grade compensation, Ruling gradient, momentum gradient, pusher gradient, gradient in station yards, Grade compensation on curves, Widening of gauge on curves, Extra clearance on curves, Super elevation or cant, Objects of providing super elevation, Relationship between super elevation, gauge, speed, radius of curve and average speed, Limits of super elevation, Cant deficiency, Negative cant, Types of curves- transition curves, necessity of providing transition curves, types and length of transition curves, Curve indicator, Check rails- purpose and necessity of providing check rails on curves.

**Unit IV**

**POINTS AND CROSSINGS:** Necessity of points and crossings, Functions, Components of turnouts- Left hand turnout , right hand turnout, Working of turnout, Points or switches, Type of switches, Crossings- types of crossings and crossing number, crossing used in Indian railways, Combinations of points and crossings.

**MODERN DEVELOPMENTS IN RAILWAYS:** Introduction, Modernization of tracks, Track electrification, Speed trends, Container transport services, Uniformity in gauging, Traction and tractive resistance, Modern methods of track maintenance.

## **Unit V**

**Bridges:** Difference between bridge and culvert, Components of a bridge, Various terminologies used in bridges, Main classification of bridges, Requirements of an ideal bridge, Identification of bridge, Selection of bridge site, Characteristics of an ideal bridge site, Bridge alignment and collection of bridge design data, Determination of flood discharge water way, Economic span, Scour depth, Afflux standard valves of clearance and free board as per IRC

**SUBSTRUCTURE AND SUPER STRUCTURE:** Types of bridge super structure, Bridge floorings and their selection, Bridge piers, Abutments, Wing walls, Approaches, Bridge bearings and joints in bridges

**CONSTRUCTION AND MAINTENANCE OF BRIDGES:** Erection of steel girder and truss bridges, Erecting of RCC bridges and suspension bridges, Maintenance method

### **Reference Books :**

Text book of railway engineering by R.B.Deshpandey United Book corp. pons

Railway engineering by N.K.Vaswani Roorkee publishing house

Text book of railways by R.C.Rangwale Charter publishing house, Anand. W.R.

Text book of railway engineering by S.C.Saxena & SP Arora Dhanpal Rai an Sons

Indian railway track design, construction, maintenance and modernization by M.M.Agrawal Manglik prakeshan 159, Bomani Road, Saharanpur.

Permanent way manual by Indian Railway Board

Railway Bridge and Tunnel Engg. By Shivanand Kamde Deepak Prakashan, Gwalior

Bridge Engineering by By Algia

**Diploma (Engg.)  
Civil Engineering  
Semester-VI**

**Structural Design and Drawing- II**

**Unit I**

Introduction: Types & properties of structural steel, types & designation of Indian Standard Section, Bolted & Reveted connection, concentric & eccentric connection, Types of joints, Strength and efficiency of joint, Design of bolted & reveted joints, welded connection, types, Ball and filled welding, strength of joints, Design of welded joints, concentric & eccentric joint, connection of angle with gusset plate of truss.

**Unit II**

Tension & Compression members: Types of tension member, strength of tension member, design of simple & builtup tension member, Types of compression member, Slenderness rates, effective length, strength & design of compression member.

Loads on roof truss, Live load, Dead load, Wind load, roof covering, wind pressure on truss, Design of truss, Design of angle purlin.

**Unit III**

Columns: Simple & Builtup column, short & long column, suitability of sections for column, strength of given column, Design of simple & builtup short column, Transverse system of builtup column, Design of single & double lacing, Design of battens, Column bases, Design of Slab base & Gusseted base.

**Unit IV**

Beams: Laterally supported & unsupported beams, suitability of section for beam, Design of laterally supported & unsupported beams, web buckling, web crippling, introduction of industrial building components of industrial building, Types of bracing.

**Unit V**

Plate Girder & Tower: Components of plate girder, Design for central sector of plate girder, End bearing stiffness, Intermediate & Horizontal stiffness, welded & Reveted plate girder, Types of tower, Loads on tower, component of tower, Lattice tower.

Note: All design should be as per latest version of IS800.

**List of Experiments/Drawings:**

1. Design of a concentric bolted/welded connectors
2. Design of a eccentric bolted/welded connectors
3. Design of a small truss
4. Design of a laterally supported beam
5. Design of a laterally unsupported beam
6. Design of a simple column
7. Design of a builtup column with lacing
8. Design of a builtup column with battens
9. Design of a plate girder
10. Drawing of different Indian Standard Steel Sections

**References**

Limit State Steel Design by S K Duggal

Steel Design (Limit State Method) by SS Bhavikatte

**Diploma (Engg.)  
Civil Engineering  
Semester-VI**

**Construction Management**

**Unit I**

**INTRODUCTION:** Organization-Major departments executing civil works, Structure of departments, Staff pattern in division and sub-division, Accounting system, Types of work done by department, etc.

**Unit II**

**WORK BY CONTRACT AGENCY:** Different methods for executing works in PWD, Preparation of tender invitation of a tender, Contract agreements and its different parts, Conditions of contract, Responsibilities of sub-engineer, Site order book, Procedure for issuing material, Procedure for bills.

**Unit III**

**WORK BY DEPARTMENT (A) GENERAL:** Land acquisition, Procedure for material procurement, Use of a quarry chart, Different types of accounting papers, Procedure for operation of labour rolls, Stores procedure and records indent form, Accounts of T & P, Articles, Survey report, Road metal return, Road metal rate book and its use.

**WORK BY DEPARTMENT (B) MEASUREMENT & PAYMENT:** Use of measurement book, Entries in measurement books, Standard measurement book and its use.

**Unit IV**

**CASH,BILL, AUCTION & T.A. RULES:** Procedure to settle account of money received, Modes of payment, Permanent and temporary advance, Comparison between permanent and temporary advance, Checking of bills and vouchers, Auction procedure, T.A. rules etc.

**LABOUR WELFARE & LAWS:** Measures to improve the efficiency of labour, Causes of accident, Trade unions, Aims of labour legislation, Labor courts, Attitudes of sectional officers towards labour

**Unit V**

**TIME SCHEDULE FOR WORKS:** Importance of management of works, Gantt bar chart, Limitations of chart, CPM network, Project chart

**CONSTRUCTION MANAGEMENT & EQUIPMENTS:** Civil Engg construction industry, Human resource management, Material & equipment managements, Classes of equipments, Factors in the selection of equipment, Earth moving equipment, Concreting equipment, Different types of minor machine, Vibrators

**References**

ABC of PWD accounts by C M Kaul

Oversees Account and Duties by Kumar

Construction Management and PWD Accounts by Agarwal and Arora

CPM and PERT by R M Kapoor

**EXERCISES**

1. Drafting notice inviting tender for various works. 2. Writing measurement books for different works . 3. Preparing muster rolls. 4. Preparing imprest account and temporary advance forms and developing skill for filling in forms. 5 Solving CPM and Net work problems.