

THIRD SEMESTER

CE – 330	Hydraulics
CE – 331	Structural Mechanics
CE – 332	Building Construction
CE – 333	Surveying – I
CE – 334	Water supply and waste water Engineering
CE – 335	Civil Engineering Drawing – I

RATIONALE

Construction engineering diploma holders have to supervise construction of various types of Civil Engineering works. For this purpose, they have to use various materials like stones, bricks and tiles, cement and cement based products, and lime, timber and wood based products, paint and varnishes metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. Hence this subject.

DETAILED CONTENTS

1. Building Stones: (10 %)
 Classification of Rocks.
 Geological classification: Igneous, sedimentary and metamorphic rocks.
 Chemical classification: Calcareous, argillaceous and siliceous rocks.
 Physical classification: Unstratified, stratified and foliated rocks.
 General characteristics of stones.
 Requirements of good building stones and their testing.
 Identification of common building stones.
 Various uses of stones in construction.
2. Bricks and Tiles: (20 %)
 Introduction to bricks.
 Raw materials for brick manufacturing and properties of good brick making earth.
 Classification of bricks as per IS: 1077
 Testing of common building bricks as per IS: 3495
 Compressive strength, water absorption, efflorescence test, Dimensional tolerance test.
 Special bricks.
 Building tiles: types of tiles-wall, roofing and flooring tiles.
 Ceramic tiles and their properties and uses.
 Hollow masonry blocks, Fly ash bricks,
3. Cement: (30 %)
 Introduction, raw materials, manufacture of ordinary Portland cement, flow diagram for wet and dry process.
 Properties and uses of ordinary Portland cement.
 Testing of cement as per IS: strength of cement, fineness by sieving, consistency, soundness, setting times.
 Special cements and their uses.
 Storage of cement.

4. Lime:- (5 %)

Introduction: Lime as one of the cementing materials.

Definition of terms; quick lime, fat lime, hydraulic lime, hydrated lime, lump lime.

Calcinations and slaking of lime

IS classification of lime.

5. Timber and wood based products. (15 %)

Identification of different types of timber: Teak, Deodar, Shisham, Sal, Mango, kail and chir.

**5.2 Market forms of converted timber as per IS.

Seasoning of timber: purpose, methods of seasoning, Kiln seasoning as per IS.

Defects in timber, decay in timber.

Preservation of timber and methods of treatment as per IS.

Properties of timber and specifications of structural timber..

5.7.1 Other wood based products, their brief description of manufacture and uses:

Lamin board, Black board, fibre board. Hard board, and gypsum board.

6. Paints and Varnishes: (5 %)

Purpose and use of paints.

Types, ingredients, properties and uses of oil paints, water paints and Cement paints

Types, properties and uses of varnishes

6.5 Trade name of different products.

7. Metals: - (5 %)

Ferrous metals: composition, properties and uses of cast iron, steel (mild and high tension steel) requirements of mild steel as per IS.

Non-ferrous metals: properties and uses of the following non-ferrous metals in civil

Engineering works –copper, lead, Zinc, tin and aluminum.

Commercial forms of ferrous and non-ferrous metals.

8. Mortar: (5 %)

Definition- Properties and uses of Mortar

Types of mortar, cement & lime Mortar

Preparation of cement Mortar

9. Miscellaneous Materials: (5 %)

Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes

Fibre Sheets and their manufacture process.

Types and uses of insulating materials for sound and thermal insulation

Construction chemicals like water proofing compound, epoxies, polymers

Water proofing, termite proofing and fire resistance materials – types and uses

Materials used in interior decoration works like POP, methods of doing POP Note:

A field visit may be planned to explain and show the relevant things.

(b) PRACTICAL EXERCISES:

- i. To determine the crushing strength of bricks.
- ii. To determine the water absorption of bricks.
- iii. To conduct field tests on cement.
- iv. To determine fineness (by sieve method) of cement.
- v. To determine normal consistency of cement.
- vi. To determine initial and final setting times of cement.
- vii. To determine soundness of cement.
- viii. To determine compressive strength of cement.
- ix. A report on use of new and latest material being used in construction industry.

(c) INSTRUCTIONAL STRATEGY

Teachers are expected to physically show various materials while imparting instructions. Field visits should also be organized to show manufacturing processes and use of various materials in Civil Engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic.

(d) REFERENCES

- (1) Sharma, SK; and Mathur, GC; " Engineering Materials;" Delhi-Jalandhar, R. Chand and Co.
 - (2) Surendra Singh; "Engineering Materials; "New Delhi". Vikas Publishing House Pvt. Ltd.
 - (3) Chowdhuri, N; "Engineering Material;" Calcutta, Technical Publishers of India.
 - (4) Bahl, SK; "Engineering Materials; "Delhi, Rainbow Book co.
 - (5) TTTI, Chandigarh "Civil Engineering Materials; "Tata McGraw Hill.
 - (6) Kulkarni, GJ; "Engineering Materials; "Ahmedabad, Ahmedabad Book Depot.
 - (7) Shahane; Engineering Materials; Poona, Allied Book Stall.
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CE 330 HYDRAULICS

	L	T	P
Pds/week	4	-	2

RATIONALE

Subject of hydraulics is a basic science subject and helps in solving problems in the subject of Public Health Engineering / Environmental Engineering and Irrigation Engineering. Principles of hydraulics also find its application in Bridge Engineering and in many other Civil Engineering subjects. The subject deals with basic concepts and principles in hydraulic, hydro kinematics and hydrodynamics and their application in solving fluid flow problems.

Note: Weightage of each topic for external examination is given in the brackets.

DETAILED CONTENTS

THEORY

1. Introduction (5 %)
Fluid: Real fluid, ideal fluid.
Fluid Mechanics, hydraulics, hydrostatics, hydro kinematics and hydrodynamics.
2. Properties of Fluids: (10 %)
Mass density, specific weight, specific gravity, cohesion, adhesion, viscosity, surface tension, capillarity, vapour pressure and compressibility.
Units of measurement.
3. Hydrostatic Pressure: (10 %)
Pressure, intensity of pressure, pressure head, Pascal's law and its applications.
Total pressure, resultant pressure, and centre of pressure.
Total pressure and centre of pressure on vertical and inclined plane surface: Rectangular, triangular, trapezoidal, circular shapes.
4. Measurement of Pressure: (10 %)
Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.
Piezometer, simple manometer, differential manometer and mechanical gauges.
5. Fundamental of Fluid Flow: (15 %)
Types of flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow.
Discharge and continuity equation (flow equation).
Types of hydraulic energy: Potential energy, kinetic energy, pressure energy.

Bernoulli's theorem: statement and description (without proof of theorem).

6. Flow Measurements: (10 %)
- Venturimeter
 - Pitot tube
 - Orifice and orifice meter
 - Current Meter.
 - Notches and weirs (simple Numerical Problems)

7. Flow through Pipes: (20 %)
- Definition, laminar and turbulent flow, explain through Reynold's experiment.
Reynold's number, critical velocity and velocity distribution.
Head loss in pipelines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula).
Hydraulic gradient line and total energy line.
Flow from one reservoir to another through long pipe of uniform and composite section.
Water hammer phenomenon and its effects elementary treatment)
Pipes in series and parallel.

8. Flow through open Channels: (No Numericals) (15 %)
- Definition of a channel, uniform flow and open channel flow.
Discharge through channels using.
- i) Chezy's formula (no derivation)
 - ii) Manning's formula

Most economical sections

- i) Rectangular
- ii) Trapezoidal

9. Hydraulics Machines:(No Numericals) (5 %)
- Reciprocating pumps.
Centrifugal pumps
Impulse turbines
Reaction turbines
Sketching and description of principles of working of above mentioned machines.

Practical Exercises

- i) To verify Bernoulli's Theorem.
- ii) To find out venturimeter coefficient.
- iii) To determine coefficient discharge (C_d) coefficient of contraction (C_c) of an orifice and verify the relation between them.
- iv) To perform Reynold's experiment.
- v) To determine Darcy's coefficient of friction for flow through pipes.

- vi) To verify loss of head due to
 - a) Sudden enlargement
 - b) Sudden Contraction

- vii) To determine velocity of flow of an open channel by using a current meter.
- viii) To determine coefficient of discharge of a rectangular notch/triangular notch.

- ix) Study of the following:
 - i) Reciprocating pump or Centrifugal pump.
 - ii) Impulse turbine or Reaction turbine.
 - iii) Pressure gauge/water meter/mechanical flow meter/Pitot tube.

INSTRUCTIONAL STRATEGY

Hydraulics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problem in the class room and provide tutorial exercise so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory.

REFERENCES

1. Jagdish Lal, "Fluid and Hydraulics" Delhi Metropolitan Book Co. Pvt. Ltd.
 2. Modi, PN and Seth, SM; "Hydraulics and Fluid Mechanics", Delhi Standard Publishers Distributors.
 3. Khurmi RS, "Hydraulics and Hydraulics Machines", Delhi S Chand and Co.
 4. Likhi SK, "Laboratory Manual in Hydraulics", Delhi Wiley Eastern.
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CE 331 STRUCTURAL MECHANICS

	L	T	P
Pds/week	4	-	2

RATIONALE

This is a basic engineering subject. The purpose of the subject is to impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to strength of materials. This subject will also enable the students to continue their further education.

DETAILED CONTENTS

THEORY:

1. Properties of Materials (5%)

Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.

Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.

2. Simple Stresses and Strains: (10%)

Concept of stress, normal and shear stresses,

Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain

Hooke's law, moduli of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.

Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars (two or three) due to axial load.

Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety.

Temperature stresses and strains

3. Shear Force and Bending Moment: (15%)

Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, cantilever and continuous beams (only concept).

Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)

Concept of bending moment and shear force, sign conventions

Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed

Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

4. Moment of Inertia: (10%)

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

5. Bending Stresses in Beams: (10%)

Concept of pure/simple bending

Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only

5.3. Moment of resistance

5.4. Calculations of bending stresses in simply supported beam

6. Combined Direct and Bending Stresses: (10%)

Concentric and eccentric loads single axis eccentricity only

Effect of eccentric load on the section stresses due to eccentric loads,

Numerical in the case of short columns.

Simple problems on stability of masonry dams and retaining walls

7. Shear Stresses in Beams (5%)

Concept of shear stresses in beams, shear stress distribution in

rectangular, circular I, T, L sections (Formula to be stated, no derivation)

8. Slope and Deflection: (5%)

Necessity for determination of slope and deflection
Moment area theorem (no derivation, numerical problems)

9. Columns: (10%)

Theory of columns
Eulers and Rankine Formula (No derivation)

10. Analysis of Trusses: (10%)

Concept of a perfect, redundant and deficient frames
Assumptions and analysis of trusses by:

- a) Method of joints
- b) Method of sections
- c) Graphical method

PRACTICAL EXERCISES

- i) Determination of yields stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel.
- ii) Determination of Young's modulus of elasticity for steel wire with Searl's apparatus.
- iii) Determination of modulus of rupture of a timber beam.
- iv) Verification of forces in framed structure.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve tutorial sheets independently. In the practical works, individual students should be given opportunities to do practical work, make observations and draw conclusions. Teachers should also conduct viva examination in which stress should be given on the understanding of basic concepts and principles.

RECOMMENDED BOOKS

- i) Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi
- ii) Ram Chandra, "Applied Mechanics and Strength of Materials", Standard

Publishers. Delhi:

- iii) Punmia, BC., "Strength of Materials", Standard Publishers, Delhi,
- iv) Prasad VS " Structural mechanics Galgotia publications Pvt Ltd, Delhi
- v) Sadhu Singh "Strengths of Materials" Standard Publishers, New Delhi
- vi) Singh Birinder "Structural Mechanics" Kaption Publishers, Ludhiana
- vii) Singh Harbhajan, " Structural Mechanics" ., Abhishek Publishers, Chandigarh
- viii) Singh Harbhajan, "Design of Masonry and Timber Structures" Abhishek Publishers, Chandigarh.

CE 332 BUILDING CONSTRUCTION

	L	T	P
Pds/week	4	-	2

RATIONALE

Diploma holders in Civil Engineering are supposed to supervise construction of buildings. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their construction is very important for Civil Engineering diploma holders. Exposure to National Building Code shall be encouraged.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Introduction: (5%)
Definition of a building, classification of buildings based on occupancy
Different parts of a building
Orientation and ventilation of buildings
Concept of Agronomy
2. Foundations: (12%)
Concept of foundation and its purpose
Types of foundations-shallow and deep
**2.2.1 Shallow foundation-constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns, raft foundation, combined tooting.
Deep foundations. Pile foundations; their suitability, classification of piles according to function, material and installation of concrete piles (undreamed, bored, compacted)
Construction-preparing foundation plans, setting out, excavation, timbering and dewatering.
3. Walls: (10%)
Purpose and Classification of walls- load bearing, non-load bearing, dwarf, retaining, breast walls and partition walls
Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
**3.4 Brick masonry-Definition of terms: mortar, bond, facing, backing, hearting, column, pillar, jambs, reveals, soffit, plinth, plinth masonry, header,

stretcher, bed of brick, bat, queen closer, king closer, frog and quoin
Bond-meaning and necessity; English bond; Bond only 1, 1-1/2 and 2 Brick thick walls in English Bond. T, X and right-angled corner junctions Thickness for 1, 1-1/2 and 2 Brick square pillars in English bond.

Construction of Brick Walls-Method of laying bricks in walls, precautions observed in the construction of walls, method of bonding new brick work with old (Toothing, raking back and block bonding)

Construction, expansion and contraction joints; purpose and constructional details.

****3.5 Stone Masonry:**

Glossary of terms-Natural bed, bedding planes, string course, corbel, cornice, block-incourse, grouting, mouldings, templates, throating, through stones, parapet, coping, pilaster and buttress

Types of stone Masonry:

Rubble Masonry: random and coarsed, Ashlar Masonry: Ashlar fine, Ashlar rough, Ashler facing, specifications for coarsed rubble masonry, principles to be observed in construction of stone masonry walls

Partition walls: Constructional details, suitability and uses of brick and wooden partition walls

Mortars-preparation, use, average strength and suitability of cement, lime, lime cement, lime surkhi and mudnortar

Scaffolding: Constructional details and suitability of mason's brick layers and tubular scaffolding

Shoring and under pinning: Types and uses

Safety in construction of low rise and high rise buildings

4. Arches and Lintels: (8%)

Meaning and use of arches and lintels:

Glossary of terms used in arches and lintels – abutment, peir, arch ring, intrados, soffit, extrados, voussoiers, springer, springing line, crown, key stone, skew back, span, rise, depth of a arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

Arches:

Types of Arches – Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

Stone arches and their construction

Brick arches and their construction

****5 Doors and Windows: (5%)**

Glossary of Terms used in Doors and windows

Doors – name, uses and Types: metal doors, ledged and battened doors, ledged, battened and braced door, framed and paneled doors, glazed and paneled doors, flush doors, collapsible doors, rolling steel shutters, side sliding doors, door frames, PVC shutters and metal doors

Window-names, uses and Types: metal windows, fully paneled windows,

fully glazed windows, casement windows, fanlight windows and ventilators, sky light window frames, louvered shutters (emphasis shall be given for using metals and plastics etc. in place of timber)

*6. Damp Proofing: (8%)

Dampness: sources, causes and its ill effects,

Types of dampness, Damp proofing materials and their specifications

Methods of damp proofing: basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills

Plinth protection and aprons

**7. Floors: (8%)

Ground floors

Glossary of terms-floor finish, topping, under layer, base course, rubble filling, dado and their purpose

Types of floor finishes –cast-in-situ, concrete flooring (monolithic, bonded) Terrazo flooring, Stone flooring(marble/Granite), Timber flooring, PVC floor, ceramic floor description with sketches of the methods of construction of the floors and their specifications, floor polishing.

Upper floors

Flooring on RCC/RB Slab

Maintenance of floors.

8. Roofs: (9%)

Types of roofs, concept of flat, pitched, arched and cell roofs

Glossary of terms for pitched roofs – Various types of Trusses: Timber and steel, batten, eaves, barge, fascia board, gable hip, lap, purlin, rafter, rag bolt, valley, ridge, etc.

Drainage arrangement for pitched and flat roofs

**9. Stairs: (5%)

Glossary of terms: different means of access to various floor, stair case, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand rail, nosing, etc.

Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc

Various types of layout-straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

10. Surface Finishes: (5%)
Plastering – classification according to use and finishes like grit finish, rough cast, pebble dashed, plain plaster etc. dubbing, proportion of mortars used for different plasters, preparation of mortars, techniques of plastering and curing
Pointing – different types of pointing, mortar used and method of pointing
Painting – preparation and application of paints on wooden, steel and plastered wall surfaces
White washing, colour washing and distempering, application of cement and plastic paints
Commonly used water repellent for exterior surfaces, their names and application

11. Concept of Seismic in Planning and Design of Buildings: (5%)
Introduction to earthquakes
Magnitude and intensity, seismic zoning, seismograph
Precautions to be observed in the design of earthquake prone buildings

12. Building Planning: (5%)
Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public building
Building planning, arrangement of doors, windows, cupboards etc for residential building.
12.3. Modern construction practices: Concept of pre engineered building (PEB), High rise buildings, Lift slab construction, slip formwork, Tunnel Boring Machine (TBM)

13. Anti Termite Measures (As per IS 6313 –I – III) (5%)
Introduction, site preparation and chemicals used in anti-termite treatment
Treatment of masonry foundation
Treatment of RCC foundation
Treatment of top surface of earth filling
Treatment of junction of walls and floors
Treatment along external perimeter of building
Treatment and selection of timber
Treatment in existing buildings

14 Building Services (5%)
Introduction to fire fighting systems, Ducting for Air-conditioning, service lines for cable telephone, and electrical wiring , garbage disposal systems. Water supply system (internal and external).

15. Elementary idea of interior decoration, wall paneling, false ceiling, flooring etc. (5%)

NOTE: * An expert may be invited from field/industry for extension lecture
** A field visit may be planned to explain and show the relevant things

PRACTICAL EXERCISES

- i) Demonstration of tools and plants used in building construction
- ii) Layout of building
- iii) To construct brick bonds (English bond only) in one, one and half and two brick thick:
 - a) Walls for L, T and cross junction
 - b) Columns
- iv) Visit to construction site for showing the following items of works and to write specific report about the works seen
 - a) Timbering of excavated trenching
 - b) Damp roof courses
 - c) Construction of masonry walls
 - d) Flooring: Laying of flooring on an already prepared lime concrete base
 - e) Plastering and pointing
 - f) White and colourwashing
 - g) Use of special type of shuttering/cranes/heavy machines in construction work

INSTRUCTIONAL STRATEGY

While imparting instructions in this subject, teachers are expected to take students to work site and explain constructional process and special details for various sub-components of a buildings. It is also important to make use of audio visual aids/video films (if available) to show specialized operations. The practical work should be given due importance and efforts should be made that each student should perform practical work independently. For carrying out practical works, polytechnics should have building yard where enough raw materials is made available for students to perform practical work.

REFERENCES

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House
 2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction", Poona, United Book Corporation
 3. Rangwala, SC; "Building Construction"; Anand, Charotar Book Stall
 4. Kulkarni, GJ; "A Text Book of Building Construction", Ahmedabad Book Deport
 5. Arora, SP and Bindra, SP; "A Text Book if Building Construction"; New Delhi Dhanpt Rai and Sons
 6. Sharma, SK and Kaul, BK; "A Text Book of Building Construction", Delhi, S Chand and Co.
 7. Sushil Kumar; "Building Construction", Delhi Standard Publishers Distributors
 8. Moorthy, NKR; "A Text Book of Building Construction", Poona, Engineering Book Publishing Co.
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	L	T	P
Pds/week	2	-	4

RATIONALE

The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works

While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying,

Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

DETAILED CONTENTS

1. Introduction: (10%)
 Basic principles of surveying
 Concept and purpose of surveying, measurements-linear and angular, units of measurements

 Instruments used for taking these measurements, classification based on surveying instruments
2. Chain surveying: (15%)

 Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages
 Obstacles in chain surveying
 Direct and indirect ranging offsets and recording of field notes
 Errors in chain surveying and their corrections
3. Compass surveying: (30%)

 Purpose of compass surveying. Use of prismatic compass: Setting and taking observations

 Concept of following with simple numerical problems:
 - a) Meridian - Magnetic and true
 - b) Bearing - Magnetic, True and Arbitrary
 - c) Whole circle bearing and reduced bearing
 - d) Fore and back bearing
 - e) Magnetic dip and declination
 Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in

a compass traverse

5. Levelling:

(30%)

4.2 Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks etc

Types of levels, Identification of various parts, uses, advantages and disadvantages of

Dumpy level & Auto level.

Levelling staff- single piece, folding, invar precision staff, telescopic

Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis

Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

Temporary adjustments and permanent adjustment of dumpy level

Level book and reduction of levels by Height of Instrument method and rise and fall method (Arithmetic checks, problem on reduction of levels)

Differential leveling, Fly levelling, check leveling, profile levelling (L-section and X-section) and reciprocal leveling

Errors in levelling, permissible limits

5. Plane Table Surveying

(15%)

Purpose of plane table surveying, equipment used in plane table survey:

Setting of a plane table:

- (a) Centering
- (b) Levelling
- (c) Orientation

Methods of plane table surveying

- (a) Radiation,
- (b) Intersection
- (c) Traversing

(d) Resection

Concept of Two point and Three point problems (Concept only)

Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade

PRACTICAL EXERCISES

1. Chaining, ranging and off-setting of a survey line
2. To find out the area using chain survey.
3. Traversing using chain surveying
4. To measure the angles between the lines meeting at a point
5. Traversing using compass survey
6. To find out the reduced levels of different stations using Height of Instrument (HI) method.
7. To find out the reduced levels of different stations using rise and fall method.
8. Plotting few points by:
 - i. Radiation
 - ii. Intersection
9. Traversing an area with a plane table
10. Layout of a Building

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trigonometrical Survey (GTS), Dehradun.

RECOMMENDED BOOKS

- I. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd.

2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation
3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House
4. Kanetkar, TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan
6. Mahajan, Sanjay "Surveying -I", Tech. Publication, Delhi
7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.
8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co.

RATIONALE

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialised operations.

DETAILED CONTENTS

A. WATER SUPPLY

1. Introduction (5%)
Necessity and brief description of water supply system.
2. Quantity of Water (5%)
Water requirement
Rate of demand and variation in rate of demand
Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)
Population Forecasting
3. Quality of Water (5%)
Meaning of pure water and methods of analysis of water
Physical, Chemical and bacteriological tests and their significance
Standard of potable water as per Indian Standard
Maintenance of purity of water (small scale and large scale quantity)
4. Water Treatment (brief introduction) (10%)
**4.1 Sedimentation - purpose, types of sedimentation tanks
**4.2 Coagulation flocculation - usual coagulation and their feeding
**4.3 Filtration - significance, types of filters, their suitability
Necessity of disinfection of water, forms of chlorination, breakpoint chlorine, residual chlorine, application of chlorine.
Flow diagram of different treatment units, functions of (i) Aeration fountain
(i) mixer (iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

5. Conveyance of Water (10%)
- **5.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.
- Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses
- Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes
- Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories.
- Wastage of water - preventive measures
- Maintenance of distribution system
- Leakage detection
6. Laying out Pipes (10%)
- Setting out alignment of pipes
- Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil.
- Handling, lowering beginning and jointing of pipes
- Testing of pipe lines
- Back filling
- Use of boring rods
7. Building Water Supply (5%)
- Connections to water main (practical aspect only)
- **7.2 Water supply fixtures and installations and terminology related to plumbing
- B. WASTE WATER ENGINEERING
8. Introduction (5%)
- Purpose of sanitation
- Necessity of systematic collection and disposal of waste
- Definition of terms in sanitary engineering
- Collection and conveyance of sewage
- Conservancy and water carriage systems, their advantages and Disadvantages
- (a) Surface drains (only sketches) : various types, suitability
- (b) Types of sewage: Domestic, industrial, storm water and its seasonal variation
9. Sewerage System (5%)
- Types of sewerage systems, materials for sewers, their sizes and joints
- Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

10. Laying and Construction of Sewers: (10%)
 Setting out/alignment of sewers
 Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.
 Construction of surface mains and different sections required
- 11 Sewage characteristics: (5%)
 Properties of sewage and IS standards for analysis of sewage
 Physical, chemical and bacteriological parameters
12. Natural Methods of Sewerage Disposal (10%)
 General composition of sewage and disposal methods
 Disposal by dilution
 Self purification of stream
 Disposal by land treatment
 Nuisance due to disposal
13. Sewage Treatment (10%)
 Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams
 Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant)
14. Building Drainage (5%)
 Aims of building drainage and its requirements
 **14.2 Different sanitary fittings and installations
 14.3 Traps, seals, causes of breaking seals

** A field visit may be planned to explain and show the relevant things.

LIST OF PRACTICALS

- 1) To determine turbidity of water sample
- 2) To determine dissolved oxygen of given sample
- 3) To determine pH value of water
- 4) To perform jar test for coagulation
- 5) To determine BOD of given sample
- 6) To determine residual chlorine in water
- 7) To determine conductivity of water and total dissolved solids
- 8) To study the installation of following:
 - a) Water meter
 - b) Connection of water supply of building with main
 - c) Pipe valves and bends
 - d) Water supply and sanitary fittings
- 9) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes,

D.I. pipes and PVC pipes.

- 10) To demonstrate the laying of SW pipes for sewers
- 11) Study of water purifying process by visiting a field lab.
- 12) To test house drainage

INSTRUCTIONAL STRATEGY:

Before imparting the instructions in the class room, visits to water works and sewage treatment plants can go a long way for increased motivation of students for learning in the class room. As the subject is of practical nature, lecture work be supplemented by field visits from time to time. Home assignments related to collection of information, pamphlets and catalogues from hardware shop dealing water supply and sanitary fittings will be very helpful for the students.

REFERENCES

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8. Garg, Santosh Kumar; "Sewage and Waste Water Disposal Engineering"; Khanna Publishers, Delhi
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- 10 Duggal, Ajay K and Sharma, Sanjay, "A Laboratory Manual in Public Health Engineering", , Galgotra Publications, 2006, New Delhi
- 11 Gurjar,B.R. " Sludge Treatment & Disposal" Oxford and IBH Co Pvt Ltd New Delhi.
12. Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya Prakashan Ltd., Delhi.

CE 335 CIVIL ENGINEERING DRAWING-I

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Pds/week	2	-	6

RATIONALE

Drawing is the language of engineers. Engineering is absolutely incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small building, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

NOTE: IN EXTERNAL EXAM SIX NOS OF DRAWING QUESTIONS SHALL BE ASKED. OUT OF WHICH STUDENT SHALL BE ASKED TO ATTEMPT THREE QUESTIONS MAXIMUM.

DETAILED CONTENTS

Drawing No. 1:

Details of spread footing foundations for load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC; details of basement showing necessary damp proofing.

Drawing No.2:

Plans of T and Corner junction of walls 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No. 3:

Elevation, sectional plan and sectional side elevation of paneled and glazed floor, steel windows and aluminium windows

Drawing No. 4:

Wooden roof truss showing details of joints, fixation of roof coverings, eaves and gutters. (King and queen post)

Drawing No.5:

Drawing plan, elevation of a small building by measurement.

Drawing No. 6:

Drawing detailed plan, elevation and section of a two room residential building from a

given line plan, showing details of foundations, roof

and parapet Drawing NO. 8:

Drawing plan and section of a dog legged stair, quarter turn stair in a given room (excluding reinforcement details)

Drawing No. 9:

Drawing of a small single storey building showing position of sanitary fittings house drainage and electrical fittings

Drawing No. 10:

Drawing details of damp proofing arrangement of roofs, basement floors and walls as per BIS Code

NOTE a) All drawings should be as per BIS code and specification in SI units.

b) Intensive practice of reading and interpreting building drawings should be given

INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation of water supply and sanitary engineering and irrigation engineering drawings as per IS code of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy. At different intervals of time, practice of reading and interpreting actual field drawing should also be practiced so as to develop necessary competencies in the students.