



# PM

## POLYTECHNIC

A Unit of Puran Murti Educational Society  
Approved by AICTE, Ministry of HRD, Govt. of India,  
Affiliated to State Board of Technical Education, Panchkula, Haryana

### Scheme for Fourth Semester (Civil Engineering)

Sr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESMENT (EXAMINATION)				
		Theory	Practical	Written Paper		Practical					
		Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.				
4.1	Concrete Technology	3	-	2	25	25	100	3	50	3	200
4.2	Water Supply and Waste Water Engineering	5	-	2	25	25	100	3	50	3	200
4.3	Irrigation Engineering	4	-	-	50	-	100	3	-	-	150
4.4	Surveying – II	2	-	6	25	25	100	3	50	3	200
4.5	RCC Design	5	-	-	50	-	100	3	-	-	150
4.6	Civil Engineering Drawing –II	-	-	6	-	50	-	-	100	3	150
# Student Centered Activities		-	-	5	-	25	-	-	-	-	25
<b>Total</b>		<b>19</b>	<b>-</b>	<b>21</b>	<b>175</b>	<b>150</b>	<b>500</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>1075</b>

# Student Centred Activities will comprise of co-curricular activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/Disaster Management activities etc.

**Note:** Survey camp will be held after 4th semester for minimum 15 days in a sub mountainous area away from polytechnic preferably in camp conditions. Details are given at Sr. No. 5.3 in 5th Semester.



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## SYLLABUS: Polytechnic (CE)

Department: Civil Engineering – 4<sup>th</sup> Semester

Subject: Concrete Technology (Theory)

Subject Code: 120741

### Detailed Contents

#### **Unit No.1 Introduction**

Topic No.1: Definition of concrete

Topic No.2: Uses of Concrete In Comparison To Other Building Materials

#### **Unit No.2 Ingredients of Concrete**

Topic No.3: Physical Properties of Cement, Different Types of Cement, Classification of Aggregates According To Size and Shape,

Topic no.4: Surface Textures, Specific Gravity of Aggregate; Bulk Density, Water Absorption, Surface Moist Bulking Of Sand, Deleterious Materials, Soundness Grading of Aggregates: Coarse Aggregate, Fine-Aggregate; All- In aggregate, Fineness Modulus; Interpretation of Grading Charts, Water: Quality Requirements As Per IS: 456-2000

#### **Unit no.3 Water Cement Ratio**

Topic No.5: Hydration of Cement Principle of Water-Cement Ratio, Duff Abram's, Water-Cement Ratio Law: Limitations of Water- Cement Ratio Law and Its Effects on Strength of Concrete

#### **Unit No. 4 Workability**

Topic No.6: Factors Affecting Workability, Measurement of Workability, Slump Test, Compacting Factor and Vee Bee Consist meter, Recommended Slumps for Placement in Various Conditions as per IS: 456-2000

#### **Unit No. 5 Properties of Concrete**

Topic No.7: Properties in Plastic State: Workability, Segregation, Bleeding and Harshness

Topic No.8: Properties In Hardened State: Strength, Durability, Impermeability, Dimensional Changes

#### **Unit No. 6 Proportioning For Normal Concrete**

Topic No.9: Objectives of mix design, introduction to various grades as per IS:456-2000

Topic No.10: Adjustment on Site for: Bulking Of Fine Aggregate, Water Absorption of Aggregate, Workability

Topic No.11: Difference between nominal and controlled concrete Introduction to IS-10262-2009-Code for Controlled Mix Design

#### **Unit No. 7 Admixtures**

Topic No.12: Introduction to Admixtures Chemicals and Minerals for Improving Performance of Concrete

#### **Unit No. 8 Special Concretes**

Topic No.13: Concreting Under Special Conditions, Difficulties and Precautions Before, During and After Concreting Cold Weather Concreting, Under Water Concreting, Hot Weather Concreting

Topic No.14: Ready Mix Concrete, Fiber Reinforced Concrete Polymer Concrete, Fly Ash Concrete, Silica Fume Concrete

#### **Unit No 9 Concreting Operations**

Topic No.15: Storing of Cement, Storing Of Cement In A Warehouse, Storing Of Cement At Site, Effect Of Storage On Strength of Cement, Determination Of Warehouse Capacity For Storage Of Cement.

Topic No.16: Storing of Aggregate: Storing of aggregate at site Batching, Batching of Cement Batching of aggregate By: Volume, using gauge box (farm) selection of proper Gauge box Weight spring balances and batching Machines, Measurement of water

Topic No.17: Mixing: Hand Mixing Machine Mixing - Types Of Mixers, Capacities Of Mixers, Choosing Appropriate Size Of Mixers, Operation Of Mixers Maintenance And Care Of Machines

Topic no.18: Transportation of concrete: Transportation of concrete using wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.

Topic No.19: Placement Of Concrete: Checking Of Form Work, Shuttering And Precaution Be Taken During Placement

Topic no.20: Compaction: Hand compaction Machine compaction - types of vibrators, internal screed Vibrators and Form vibrator Selection of suitable vibrators for different situations

Topic No.21: Finishing Concrete Slabs - Screeding, Floating and Trowelling Curing: Objectives of curing, methods of Curing Like ponding, membrane curing, steam curing, chemical curing Duration for curing and removal of Formwork



**Topic No.22: Jointing: Location of Construction Joints, Treatment Of Construction Joints, Expansion Joints in Buildings -Their Importance and Location Defects in Concrete: Identification Of and Methods of Repair**

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4		-	25	-	100	3	-	-	125

### RECOMMENDED BOOKS

- 1) Kulkarni, PD; Ghost, RK and Phull, YR; "Text Book of Concrete Technology";Oxford and IBH Publishing Co. New Delhi
- 2)Krishnamurthy, KT; Rao, A Kasundra and Khandekar, AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi,
- 3) Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.
- 4) Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi
- 5)Neville, AM;"Properties of Concrete", Pitman (ELBS Edition available),
- 6) London Orchard;"Concrete Technology";Vol I,II,and III
- 7) Handoo, BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; SatyaPrakashan, New Delhi,
- 8) Sood, Hemant, Mittal LN and Kulkarni PD; "Laboratory Manual on Concrete Technology",CBS Publishers, New Delhi, 2002
- 9) Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers,Delhi,Gambhir, ML; Concrete Technology";, MacMillan India Ltd., New Delhi
- 10)Siddique, R.,Special Structural Concretes"Galgotia Publishers Pvt. Ltd. Delhi
- 11)Birinder Singh, "Concrete Technology", Kaption Publications, Ludhiana,
- 12) Module on 'Special Concretes by Dr Hemant Sood , NITTTR Chandigarh Concrete Technology by P Dayaratman
- 13) Video programme on different experiments in 'Concrete Technology' developed by NITTTR, Chandigarh.

### INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various stages of concreting operations. While working in the laboratory, efforts should be made to provide extensive practical training to students so as to make them confident in the preparation and testing of concrete. Teachers should also organize viva examination so as to develop understanding about concepts and principles involved. The experiments may be demonstrated to students through video programmers developed in the field of 'concrete technology' by NITTTR, Chandigarh.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	06	12
3	02	04
4	04	08
5	08	18
6	04	08
7	03	07
8	06	12
9	12	25
10	01	02
<b>Total</b>	<b>48</b>	<b>100</b>



**Subject: Concrete Technology (Practical)**

**Subject Code: 120741(P)**

### List Of Practical Experiment

- 1) To determine the physical properties of cement as per IS Codes
- 2) To determine flakiness and elongation index of coarse aggregates
- 3) To determine silt in fine aggregate
- 4) Determination of specific gravity and water absorption of aggregates
- 5) Determination of bulk density and voids of aggregates
- 6) To determine surface moisture in fine aggregate by displacement method
- 7) Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
- 8) To determine necessary adjustment for bulking of fine aggregate
- 9) To determine workability by slump test:
- 10) To verify the effect of water, fine aggregate/coarse aggregate ratio and Aggregate/Cement ratio on slump
- 11) Compaction factor test for workability
- 12) Non destructive test on concrete by:
  - a) Rebound Hammer Test
  - b) Ultrasonic Pulse Velocity Test
- 13) Tests for compressive strength of concrete cubes for different grades of concrete

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-		2	-	25	-	-	50	3	75



## Detailed Contents

### **Unit no.1 Introduction**

Topic no.1: Definition of irrigation Necessity of irrigation

Topic no.2: History of development of irrigation in India. Major, medium and minor irrigation projects

### **Unit no.2 Water Requirement of Crops**

Topic no.3: Principal crops in India and their water requirements

Topic no.4: Crop seasons – Kharif and Rabi

Topic no.5: Soil water, soil crop and water relationships, duty, delta and base period, their relationship

Topic no.6: Gross commanded area (GCA), cultural commanded area (CCA), intensity of irrigation, irrigable area

### **Unit no.3 Hydrological Cycle Catchment Area and Run-off)**

Topic no.7: Rainfall, definition rain-gauges – automatic and non-automatic

Topic no.8: methods of estimating average rainfall (Arithmetic system); catchment area runoff, factors affecting runoff,

Topic no.9: hydrograph, basic concept of unit hydrograph

### **Unit no.4 Methods of Irrigation**

Topic no.10: Flow irrigation - its advantages and limitations Lift Irrigation – Tube well and open well irrigation, their advantages And disadvantages

Topic no.11: Sprinkler irrigation conditions favorable and essential requirements for sprinkler irrigation, sprinkler system Classification and component parts

Topic no.12: Drip irrigation, suitability of drip irrigation, layout, component parts, and advantages

### **Unit no.5 Canals**

Topic no.13: Classification, appurtenances of a canal and their functions, sketches of different canal cross-sections (unlined)

Topic no.14: Various types of canal lining, their related advantages and disadvantages, sketches of different lined canal x- Sections, Breaches and their control, Maintenance of lined and unlined canals

### **Unit no.6 Tube Well Irrigation**

Topic no.15: Introduction, occurrence of ground water, location and command, advantages and disadvantages, Comparison with Canal irrigation Tube wells, explanation of terms: water table, radius of influence, Depression head, cone of Depression, confined and unconfined aquifers. Yield of a well and methods of Determining yield of well

Topic no.16: Types of tube wells, cavity, strainer and slotted type; Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance

Topic no.17: Water Harvesting Techniques: Need and requirement of various methods ,Run-off from roof top and ground Surface, construction of recharge pits and recharges wells and their maintenance

### **Unit no.7 . Dams**

Topic no.18: Classification of dams; earthen dams - types, causes of failure cross section of zoned earthen dams, method Of Construction, gravity dams –types, cross-sections of a dam, method of construction

Topic no.19: Concept of small and micro dams, Concept of spillways and energy dissipaters

### **Unit no.8 Canal Head Works and Regulatory Works**

Topic no.20: Definition, object, general layout, functions of different parts of head works, Difference between weir and Barrage.

### **Unit no.9 Cross Drainage Works**

Topic no.21: Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet, pipe Crossing, Sketches of the above cross drainage works

### **Unit no.10 Definitions of following Hydraulic Structure with Sketches**

Topic no.22: Falls Cross and head regulators, Outlets, Canal Escapes

### **Unit no.11 River Training Works**

Topic no.23: Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

### **Unit no.12 Water Logging and Drainage and Ground Water Re-charge**



Topic no.24: Definition of water logging – its causes and effects, detection, prevention and remedies, Reclamation of soil

Topic no.25: Surface and sub-surface drains and their layout Concept and various techniques used for ground water re-Charge

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-	-	50	-	100	3	-	-	150

### INSTRUCTIONAL STRATEGY

The teaching of the subject should be supplemented by field visits at regular intervals of time to expose the students to irrigation works. Students should be asked to prepare and interpret drawings of various irrigation works.

### RECOMMENDED BOOKS

1. Bharat Singh, 'Fundamentals of Irrigation Engineering', Nem Chand and Bros, Roorkee
2. Garg, Santosh Kumar, 'Irrigation Engineering and Hydraulics Structures', Khanna Publishers, Delhi,
3. Punmia, BC; and Pande Brij Bansi Lal, 'Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi,
4. Sharma, RK; 'Text Book of Irrigation Engineering and Hydraulics Structures', Oxford and IBH Publishing Company, New Delhi
5. Sharma, SK; 'Principles and Practice of Irrigation Engineering', Prentice Hall of India Pvt. Ltd., New Delhi,
6. Varshney RS, Gupta SC, Gupta RL at all. "Theory and Design of Irrigation Structures", Vol. I and II,
7. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"
8. Priyani BB, 'The Fundamental Principles of Irrigation and Water Power
9. BIS Codes
10. Wan. E. Houk, "Irrigation Engineering" Vol. I and II
11. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted(Hrs)	Marks Allotted (%)
1	02	03
2	06	08
3	06	08
4	07	13
5	08	12
6	09	15
7	07	12
8	06	09
9	04	06
10	02	03
11	04	06
12	03	05
<b>Total</b>	<b>64</b>	<b>100</b>



## Detailed Contents

### Unit No.1 Contouring

Topic No.1: Concept Of Contours, Purpose Of Contouring, Contour Interval Horizontal Equivalent

Topicno.2: Factors Effecting Contour Interval Characteristics Of Contours Methods Of Contouring Cross Section From A Contour Map

### Unit No.2 Theodolite Surveying

Topic No.3: Working Of A Transit Vernier Theodolite And Important Termstemporary Adjustments Of A Transit Theodolite

Topic No.4: Measurement Of Horizontal And Vertical Anglesmeasurement Of Bearing Of A Line Traversing By Included Angles And Deflection Angle Method

Topic No.5: Theodolite Triangulation\_Traversing By Stadia Measurement\_Plotting A Traverse

Topic No.6: Concept Of Coordinate And Solution Of Omitted Measurements

Topic No.7: Errors In Theodolite Limits Of Precision In Theodolite Traversingheight Of Objects accessible And Non-Accessible Bases

### Unit No.3 Tacho-Metric Surveying

Topic No.8: Tachometry Instruments To Be Used In Tachometry, Methods Of Tachometry, Stadia System Of Tachometry, General Principles Of Stadia Tachometry.

### Unit No.4 Curves

Topic No.9: Simple Circular Curve, Transition Curve, Vertical Curve

### Unit No.5 Modern Surveying Equipment

Topic No.10: Edm Or Distomat, Planimeter, Total Station, Introduction To Remote Sensing, Gis And Gps

### Unit No.6 Minor Instrument

Topic No.11: Introduction And Use Of Clinometer, Pantagraph, Abney Level

Topic No.12: Use Of Planimeter For Computing Areas

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
2		-	25	-	100	3	-	-	125

### RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS "Text Book of Surveying"; S Chand and Co Ltd.,New Delhi
2. Deshpande, RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,
3. Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,
4. Kanetkar,TP and Kulkarni, SV, "Surveying and Leveling", Poona, AVG Parkashan, Pune
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling-Vol.2" AVG Prakashan, Pune
6. Punima, BC; "Surveying and Leveling ", Standard Publishers Distributors, Delhi
7. Shahai, PB; "A Text Book of Surveying ", Oxford and IBH Publishing Co.

### 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



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**SUGGESTED DISTRIBUTION OF MARKS**

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	16
2	09	28
3	04	12
4	10	34
5	02	05
6	02	05
<b>Total</b>	<b>32</b>	<b>100</b>







**Subject: Survey-2(Practical)**

**Subject Code: 120741(P)**

### List of Practical Experiment

1. Contouring:
  - 1.1) Preparing a contour plan by radial line method by the use of a Tangent Clinometers/Tachometer
  - 1.2) Preparing a contour plan by method of squares
  - 1.3) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.
2. Theodolite:
  - 2.1) Taking out the Theodolite, mounting on the tripod and placing it back in the box
  - 2.2) Study of a transit vernier theodolite; temporary adjustments of theodolite
  - 2.3) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods
  - 2.4) Measurement of vertical angles and use of tachometric tables
  - 2.5) Measurement of magnetic bearing of a line
  - 2.6) Running a closed traverse with a theodolite (at least five sides) and its plotting
  - 2.7) Height of objects with and without accessible bases
3. Curves
  - 3.1) Setting out of a simple circular curve with given data by the following methods
  - 3.2) Offsets from the chords produced
  - 3.3) One theodolite method
- 4 Minor instruments:
  - 4.1i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc.
  - 4.2) Use of planimeter for computing areas
- 5 Demonstration of digital instruments through field visits to Survey of India and other government agencies.
- 6 Total Station (only demonstrations)

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-		6	-	25	-	-	50	3	75



## Detailed Contents

### Unit No.1 Introduction

- Topic No.1: Concept of Reinforced Cement Concrete (RCC)
- Topic No.2: Reinforcement Materials: Suitability Of Steel As Reinforcing Material Properties of Mild Steel and HYSD Steel
- Topic No.3: Loading on Structures As Per IS: 875

### Unit No.2 Introduction to following methods of RCC design

- Topic No.4: Working Stress Method, Limit State Method

### Unit no.3 Shear and Development Length

- Topic No.5: Shear As Per IS: 456-2000 By Working Stress Method (1)Shear Strength Of Concrete Without Shear Reinforcement (2) Maximum Shear Stress (3) Shear Reinforcement

### Unit No. 4 Singly Reinforced Beam (Working Stress Method)

- Topic No.6: Basic Assumptions and Stress Strain Curve, Neutral Axis, Balanced, under reinforcement And Over Reinforced Beams, Moment of Resistance for Singly Reinforced Beam
- Topic No.7: Design Of Singly Reinforced Beam Including Sketches Showing Reinforcement Details

### Unit No. 5 Concept of Limit State Method

- Topic No.8: Definitions and Assumptions Made In Limit State of Collapse (Flexure), Partial Factor of Safety for Materials, Partial Factor of Safety for Loads Design Loads Stress Block, Parameters

### Unit No. 6 Singly Reinforced beam

- Topic No.9: Theory and Design of Singly Reinforced Beam by Limit State Method

### Unit No.7 Doubly Reinforced Beams

- Topic No.10: Theory and Design Of Simply Supported Doubly Reinforced Rectangular Beam by Limit State Method

### Unit No 8. Behavior Of T Beam, Inverted T Beam, Isolated T Beam And 'L' Beams (NoNumericals)

### Unit No 9 One Way Slab

- Topic No.11: Theory and Design Of Simply Supported One Way Slab Including Sketches Showing Reinforcement Details(Plan and Section) By Limit State Method

### Unit No 10 Two Way Slab

- Topic No.12: Theory And Design Of Two-Way Simply Supported Slab With Corners Free To Lift, No Provisions For Tensional Reinforcement By Limit State Method Including Sketches Showing Reinforcement Details (Plan And Two Sections)

### Unit No 11 Axially Loaded Column

- Topic No.13: Definition and Classification of Columns, Effective Length of Column Specifications for Longitudinal and Lateral Reinforcement
- Topic No.14: Design of Axially Loaded Square, Rectangular And Circular Short Columns by Limit State Method Including Sketching Reinforcement (Sectional Elevation and Plan)

### Unit No 12 Prestressed Concrete

- Topic No.15: Concept of Pre-Stressed Concrete Methods of Pre-Stressing: Pre-Tensioning and Post Tensioning
- Topic No.16: Advantages and Disadvantages of Prestressing

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
5	-	-	50	-	100	3	-	-	150

### RECOMMENDED BOOKS

1. Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi



- Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
- Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, NewDelhi
- Singh Harbhajan "Design of Reinforced Concrete Structure Design" AbhishekPublishers Ltd., Chandigarh
- Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBHPublishing Co, New Delhi.
- Singh Harbhajan, Limit Stat of RCC Design"; Abhishek Publishers Ltd.

## INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various RCC structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show form work for RCC as well as placement of reinforcement in various structural members. Commentary on BIS:456 may be referred Along with code for relevant clauses.

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	02	03
3	04	05
4	08	10
5	08	10
6	10	12
7	09	12
8	04	5
9	10	12
10	10	12
11	10	12
12	03	04
<b>Total</b>	<b>80</b>	<b>100</b>



### Detailed Contents

#### **Unit No.1 Introduction**

Topic No. 1: Necessity and brief description of water supply system

#### **Unit No.2 Quantity Of Water**

Topic No. 2: 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

#### **Unit no.3 Quality Of Water**

Topic No. 4 Meaning Of Pure Water And Methods Of Analysis Of Water

Topic No. 5 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)

#### **Unit No. 4 Water Treatment (Brief Introduction)**

Topic No.6: Sedimentation - Purpose, Types Of Sedimentation Tanks Coagulation Flocculation - Usual Coagulation And Their Feeding

Topic No.7: Filtration - Significance, Types Of Filters, Their Suitability, Necessity Of Disinfection Of Water, Forms Of Chlorination, Break Point Chlorine, Residual Chlorine, Application Of Chlorine.

Topic No.8: Flow Diagram Of Different Treatment Units, Functions

(1) Aeration Fountain, (2) Mixer, (3) Flocculate, (4) Classifier, (5) Slow and Rapid Sand Filters (6) Chlorination Chamber

#### **Unit No. 5 Conveyance of Water**

Topic No.9: 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.

Topic No.10: Appurtenances: Sluice, Air, Reflux Valves, Valves, Scour Valves, Bibcock, Stop Cocks, Fire Hydrants, Water

Topic No.11: Distribution Site: Requirement Of Distribution, Minimum Head And Rate Methods Of Layout Of Distribution Pipes. 1.) Systems Of Water Supply - Intermittent And Continuous Service Reservoirs - Types, Necessity And Accessories, 2.)Wastage Of Water - Preventive Measures Maintenance Of Distribution System

#### **Unit No. 6 Laying Out Pipes**

Topic No.12: Setting Out Alignment Of Pipes Excavation For Laying Of Pipes And Precautions To Be Taken In Laying Pipes In Black Cotton Soil.

Topic No.13: Handling, Lowering Beginning And Jointing Of Pipes 1. Testing Of Pipe Lines, 2. Back Filling, 3. Use Of Boring Rods

#### **Unit No.7 Building Water Supply**

Topic No.14: Connections to water main (practical aspect only) Water supply fixtures and installations and terminology related to plumbing

#### **WASTE WATER ENGINEERING**

#### **Unit No 8. Introduction**

Topic No.15: Purpose of Sanitation, Necessity of Systematic Collection And Disposal of Waste

Topic No.16: Definition of Terms in Sanitary Engineering, Collection And Conveyance of Sewage

Topic No.17: Conservancy And Water Carriage Systems, Their Advantages And Disadvantages  
Surface Drains (Only Sketches) : Various Types, Suitability (b)Types Of Sewage: Domestic, Industrial, Storm Water And Its Seasonal Variation

#### **Unit No 9 Sewerage System**

Topic No.18: Types Of Sewerage Systems, Materials for Sewers, Their Sizes and Joints

Topic No.19: 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

#### **Unit No 10 Laying And Construction Of Sewers**

Topic No.20: 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.

#### **Unit No 11 Sewage Characteristics:**

Topic No.21: Properties of sewage and IS standards for analysis of sewage Physical, chemical and bacteriological parameters

#### **Unit No 12 Natural Methods Of Sewerage Disposal**

Topic No.22: General Composition of Sewage and Disposal Methods Disposal by Dilution

Topic No.23: Self Purification of Stream Disposal by Land Treatment Nuisance Due To Disposal

#### **Unit No. 13 Sewage Treatment**

Topic No.24: Meaning and Principle of Primary and Secondary Treatment and Activated Sludge Process Their Flow



### Diagrams

Topic No.25: 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

### Unit No 14. Building Drainage

Topic No.26: Aims Of Building Drainage and Its Requirements

Topic No.27: Different Sanitary Fittings and Installations Traps, Seals, Causes of Breaking Seals

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
5	-	-	25	-	100	3	-	-	125

### REFERENCES

1. Duggal, KN; "Elements of Public Health Engineering";, S. Chand and Co. NewDelhi
2. Rangwala, SC; "Water Supply and Sanitary Engineering"; Anand Charotar BookStall3. Kshirsagar, SR; "Water Supply Engineering"; Roorkee Publishing House,Roorkee4. Kshirsagar, SR; "Sewage and Sewage Treatment"; Roorkee, Roorkee PublishingHouse
5. Hussain, SK; "Text Book of Water Supply and Sanitary Engineering"; Oxford andIBH Publishing Co, New Delhi,
6. Birdie, GS; "Water Supply and Sanitary Engineering"; Dhanpat Rai and Sons,Delhi
7. Garg, Santosh Kumar; "Water Supply Engineering"; Khanna Publishers, Delhi
8. Garg, Santosh Kumar; "Sewage and Waste Water Disposal Engineering"; KhannaPublishers, Delhi
9. Steel, EW; "Water Supply and Sewerage"; McGraw Hill.
- 10 Duggal, Ajay K and Sharma, Sanjay, "A Laboratory Manual in Public HealthEngineering", , Galgotra Publications, 2006, New Delhi
- 11 Gurjar,B.R. " Sludge Treatment & Disposal" Oxford and IBH Co Pvt Ltd NewDelhi.
12. Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya PrakashanLtd., Delhi.

### 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.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Marks	Time Allotted (Hrs)	Allotted (%)
1		02	03
2		06	07
3		04	05
4		09	12
5		09	11
6		06	07
7		02	03
8		04	05
9		05	06
10		06	07
11		04	05
12		05	06
13		09	12
14		09	11
<b>Total</b>		<b>80</b>	<b>100</b>



# PM POLYTECHNIC

A Unit of Puran Murti Educational Society  
Approved by AICTE, Ministry of HRD, Govt. of India,  
Affiliated to State Board of Technical Education, Panchkula, Haryana

**Subject: Water Supply And Waste Water Engineering (Practical)**

**Subject Code: 120742(P)**

## 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

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	2	-	25	-	-	50	3	75



## Detailed Contents

### Unit no.1 Drains and Sewers

Topic no.1: Cross section of standard types of open drains (circular, v-shaped and – u-shaped) with their foundations

Topic no.2: Cross section of earthen ware and RCC sewer pipes Cross sections of masonry sewers (circular and egg shaped)

### Unit.2 Traps, Manholes And Inspection Chamber

Topic no.3: Detailed Section Of Floor Trap And Gully Trap Detailed Plan And Section Of An Inspection Chamber Detailed Plan And Section Of A Manhole

### Unit.3 Septic Tank and Soak Pit

Topic no.4: Detailed plan and cross sections of a domestic septic tank with soak pit for 10 and 50 users

### Unit.4 Bath room and W.C connections

Topic no.5: Cross-section through the external wall of lavatories at ground and first floor showing the one and two pipe system and the connections of the lavatory to inspection chamber

Topic no.6: Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers

### Unit.5

Topic no.7: Draw Sectional Elevation of a Two Storeyed Building Showing Details of One Pipe and Two Pipes Systems With Sanitation System.

### Unit .6

Topic no.8: Practice Of Reading Water Supply And Sanitary Engineering Working Drawings(PWD/Urban Development Agencies) Including Hot Water And Cold Water Supply System Of A Two Room Set.

### Unit.7

Topic no.9: Detailed Layout Plan of Sewage Treatment Plant for a Residential Area and Effluent Treatment Plant For An Industrial Unit

### IRRIGATION ENGINEERING DRAWING

Topic no.10: Typical Cross-Section of a Channel- L-Section of a Channel for Given Data- Typical Cross Section Of An Unlined and Lined Channel In Cutting, Partly Cutting and Partly Filling And Fully In Filling With Given Design Data.

Topic no.11: Layout Plan of a Canal Head Works. Draw the Typical L-Section of a Weir, Draw the X-Section Of An Earthen Dam 1. Homogeneous, 2. Zoned Type 3. Diaphragm Type 4. Cross Section of a Tube Well 5. Layout And Cross Section Of Rain Water Harvesting System

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	6	-	50	-	-	100	3	150

### RECOMMENDED BOOKS

1. Loyal JS "Civil Engineering Drawing", Satya Parkashan, New Delhi
2. Chandel RP " Civil Engineering Drawings"
3. Kumar; NS " Civil Engineering Drawing " IPH, New Delhi
4. Malik RS and Meo GA, "Civil Engineering Drawing" Asian Publishing House New Delhi

### INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation and interpretation of water supply and waste water engineering drawings as per BIS codes of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy for industrial unit at different intervals of time. Reading and interpreting actual field drawings should also be practiced so as to develop necessary competency in the students