

Th4. WATER SUPPLY AND WASTE WATER ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5 th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course aims to expose the students to the current state of water supply and sewage disposal system. Through the course the principles, purposes and the methods are covered at different stages of the activity, thus laying foundation in students to think of meeting futuristic challenges.

B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Compute water demand in terms of quantity and quality
2. Describe the water sources, conveyance and distribution system
3. Realize the necessity of treatment and comprehend the principle and purpose of different water treatment processes
4. Comprehend the terminology relating to sanitary engineering and compute quantity & quality of sewage
5. Describe the sewerage system and its components stating the purposes thereof
6. Comprehend the necessity and method of sewage treatment and disposal

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
SECTION A: WATER SUPPLY		
1	Introduction to Water Supply, Quantity and Quality of water	10
2	Sources and Conveyance of water	8
3	Treatment of water	12
4	Distribution system and Appurtenance in distribution system	8
5	W/s plumbing in building	2
SECTION B: WASTE WATER ENGINEERING		
6	Introduction	5
7	Quantity and Quality of sewage	7
8	Sewerage system	5
9	Sewer appurtenances and Sewage Disposal	7
10	Sewage treatment	8
11	Sanitary plumbing for building	3

D. COURSE CONTENTS:

SECTION A: WATER SUPPLY

1 Introduction to Water Supply, Quantity and Quality of water

- 1.1 Necessity of treated water supply
- 1.2 Per capita demand, variation in demand and factors affecting demand

- 1.3 Methods of forecasting population, Numerical problems using different methods
- 1.4 Impurities in water – organic and inorganic, Harmful effects of impurities
- 1.5 Analysis of water –physical, chemical and bacteriological
- 1.6 Water quality standards for different uses

2 Sources and Conveyance of water

- 2.1 Surface sources – Lake, stream, river and impounded reservoir
- 2.2 Underground sources – aquifer type & occurrence – Infiltration gallery, infiltration well, springs, well
- 2.3 Yield from well- method s of determination, Numerical problems using yield formulae (deduction excluded)
- 2.4 Intakes – types, description of river intake, reservoir intake, canal intake
- 2.5 Pumps for conveyance & distribution – types, selection, installation.
- 2.6 Pipe materials – necessity, suitability, merits & demerits of each type
- 2.7 Pipe joints – necessity, types of joints, suitability, methods of jointing
Laying of pipes – method

3 Treatment of water

Note:

- 1. *Design of treatment units excluded.*
- 2. *Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment*
- 3. *Field visit to treatment plant, under practical should be arranged after covering this unit.*

- 3.1 Flow diagram of conventional water treatment system
- 3.2 Treatment process / units :
 - 3.2.1 Aeration ; Necessity
 - 3.2.2 Plain Sedimentation : Necessity, working principles, Sedimentation tanks – types, essential features, operation & maintenance
 - 3.2.3 Sedimentation with coagulation: Necessity, principles of coagulation, types of coagulants, Flash Mixer, Flocculator, Clarifier (Definition and concept only)
 - 3.2.4 Filtration : Necessity, principles, types of filters
Slow Sand Filter, Rapid Sand Filter and Pressure Filter – essential features
 - 3.2.5 Disinfection : Necessity, methods of disinfection
Chlorination – free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break point chlorination, super-chlorination
 - 3.2.6 Softening of water – Necessity, Methods of softening – Lime soda process and Ion exchange method (Concept Only)

4 Distribution system And Appurtenance in distribution system:

- 4.1 General requirements, types of distribution system-gravity, direct and combined
- 4.2 Methods of supply – intermittent and continuous
- 4.3 Distribution system layout – types, comparison, suitability
- 4.4 Valves-types, features, uses, purpose-slucive valves, check valves, air valves, scour valves, Fire hydrants, Water meters

5 W/s plumbing in building :

- 5.1 Method of connection from water mains to building supply
- 5.2 General layout of plumbing arrangement for water supply in single storied and multi-storied building as per I.S. code.

SECTION B: WASTE WATER ENGINEERING

- 6 Introduction**
6.1 Aims and objectives of sanitary engineering
6.2 Definition of terms related to sanitary engineering
6.3 Systems of collection of wastes– Conservancy and Water Carriage System – features, comparison, suitability
- 7 Quantity and Quality of sewage**
7.1 Quantity of sanitary sewage – domestic & industrial sewage, variation in sewage flow, numerical problem on computation quantity of sanitary sewage.
7.2 Computation of size of sewer, application of Chazy's formula, Limiting velocities of flow : self-cleaning and scouring
7.3 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological
7.4 Concept of sewage-sampling, tests for – solids, pH, dissolved oxygen, BOD, COD
- 8 Sewerage system**
8.1 Types of system-separate, combined, partially separate , features, comparison between the types, suitability
8.2 Shapes of sewer – rectangular, circular, avoid-features, suitability
8.3 Laying of sewer-setting out sewer alignment
- 9 Sewer appurtenances and Sewage Disposal:**
9.1 Manholes and Lamp holes – types, features, location, function
9.2 Inlets, Grease & oil trap – features, location, function
9.3 Storm regulator, inverted siphon – features, location, function
9.4 Disposal on land – sewage farming, sewage application and dosing, sewage sickness-causes and remedies
9.5 Disposal by dilution – standards for disposal in different types of water bodies, self purification of stream
- 10 Sewage treatment :**
*(Note: 1.Design of treatment units excluded.
2.Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment.
3.Field visit to treatment plant, under practical should be arranged after covering this unit.)*
10.1 Principles of treatment, flow diagram of conventional treatment
10.2 Primary treatment – necessity, principles, essential features, functions
10.3 Secondary treatment – necessity, principles, essential features, functions
- 11 Sanitary plumbing for building :**
11.1 Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage
11.2 Plumbing arrangement of single storied & multi storied building as per I.S. code practice
11.3 Sanitary fixtures – features, function, and maintenance and fixing of the fixtures – water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipe

E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3, 4 from Section A & Chapters 6,7,8 from Section B

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	G.S.Birdie	Text book on water supply and sanitary engineering	Dhanpat Rai Publications
2	S.K.Garg	Water Supply Engineering	Khanna Publishers
3	S.K.Garg	Waste Water Disposal Engg.	Khanna Publishers
4	By Ministry of Urban Development, Govt. of India.	CPHEEO manual Water supply	
5	By Ministry of Urban Development, Govt. of India.	CPHEC Mannual- Sewage & Sewage Treatment - by Ministry of Urban Development, Govt. of India.	