Program : **Diploma in Civil Engineering**	
Course Code : **6011A**	Course Title: **Public Health Engineering**
Semester : **6**	Credits: **4**
Course Category: **Program Elective**	
Periods per week: **4 (L:4, T:0, P:0)**	Periods per semester:**60**

Course Objectives:

- To impart knowledge to the students about the estimation of water demands for proper design of water supply works.
- To make the students aware about the different water conveyance and distribution systems.
- To Familiarize the students with different stages of water treatment, different methods of sewage treatment and disposal and operations involved.

Course Prerequisites:

Topic	Course code	Course name	Semester
Flow through Open Channel- Geometrical properties of channel section		Hydraulics and Irrigation	4
Basic knowledge in Chemistry		Engineering Chemistry	1

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Determine water demands from available data for designing water supply systems.	14	Applying
CO2	Suggest appropriate water treatment methods	15	Understanding
CO3	Identify the components required for sewerage systems	14	Understanding
CO4	Suggest appropriate sewage treatment and disposal methods	15	Understanding
	Series test	2	

CO - PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2		3					
CO3	3						
CO4			3				

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

On completion of the course, the student will able to:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Determine water demands from available data for designing water supply systems.**		
M1.01	Determine yield from surface and underground sources for a water supply scheme.	3	Applying
M1.02	Determine water demands for a water supply scheme	4	Applying
M1.03	Outline standard tests for analyzing water for drinking purposes	4	Understanding
M1.04	Identify the different components of a conveyance system	3	Understanding
Contents: **Sources of Water:** Surface source - lakes, streams, rivers and impounded reservoirs, Yield from surface source - Underground sources - springs, wells, infiltration wells and galleries - Yield from wells - test for yield. **Demand of water:** Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town. **Quality of water:** Need for analysis of water, Characteristics of water - Physical, Chemical and Biological, Testing of water for Total solids, hardness - Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints and valves - location and function on a pipe lane. Rainwater Harvesting			
CO2	**Suggest appropriate water treatment methods**		
M2.01	Identify the different stages of water treatment	4	Understanding

M2.02	Explain methods of aeration, plain sedimentation, and sedimentation with coagulation, filtration, and disinfection	4	Understanding
M2.03	Outline the construction and operation of slow sand, rapid and pressure filters and compare them	3	Understanding
M2.04	Identify the treatment methods to control of odour, colour, taste and hardness of water.	2	Understanding
M2.05	Explain with sketches the functions of the various appurtenances in a distribution system	2	Understanding
	Series Test - I	1	

Contents:

Treatmentof water: Flow diagram of different treatment units for both surface and ground sources - reservoir / pond and well Aeration - methods of aeration- Sedimentation - plain sedimentation and sedimentation by coagulation - Filtration - construction and operation of slow sand, rapid sand and pressure filters - Disinfections of water - necessity and method, chlorination, pre-chlorination, break point chlorination, super chlorination. Removal of Taste, colour, odour and hardness (No design for treatment units)

Distribution system: General requirements, system of distribution, gravity system, combined system, direct pumping- Methods of supply - intermittent and continuous - advantages & disadvantages. Layout of distribution system -Types - dead end, grid, radial and ring system, their merits, demerits and suitability.

Appurtenances in Distribution system: Uses of Sluice valves, Check valves or reflux valves, Air valves, Drain valves or blow-off valves, Scour valves, Fire hydrants and Water meters - (brief description only).

CO3	**Identify the components required for sewerage systems**		
M3.01	Define Sewage, Sewerage, Sewer, refuse, sullage, and garbage	4	Remembering
M3.02	Explain different sewerage systems	4	Understanding
M3.03	Describe the various types of sewer appurtenances	3	Understanding
M3.04	Identify characteristics of sewage	3	Understanding

Contents:

Objects of providing sewerage works - Definition of terms - sewage, sewerage, sewer, refuse, garbage, sullage etc - Systems of sewage disposal - conservancy and water carriage systems- Types of sewerage systems and their suitability - separate, combined and partially separate- Quantity of Sewage- Quantity of discharge in sewers, dry weather flow, variability of flow, limiting velocities of sewers- Surface drainages - requirements, shapes. Different shapes of

cross section for sewers - rectangular, circular, egg shaped - merits and demerits of each. Brief description and choice of types of sewers - stone ware, cast iron, cement concrete, precast sewers, AC pipe. Sewer appurtenances: - location, function and construction of Manholes, Drop man holes, Catch basins, Flush tanks and Inverted siphon -(Brief description only). Sewage characteristics: - Strength of sewage, sampling of sewage, characteristics of sewage - physical, chemical and biological - significance of the following tests for -Solids, Oxygen demand, BOD, COD, pH value, Chlorides

CO4	**Suggest appropriate sewage treatment and disposal methods**		
M4.01	List the objects of primary and secondary treatment of sewage	4	Remembering
M4.02	Outline the functions and working of screens, skimming tanks, and grit chambers.	4	Understanding
M4.03	Describe various sewage treatment and disposal methods	4	Understanding
M4.04	Identify the different drainage sanitary fittings used in buildings	3	Understanding
	Series Test - II	1	

Contents:

Sewage Treatment And Disposal:

Preliminary treatment: brief description and functions of Screens, Skimming tanks and Grit chambers. Primary treatment - brief description and functions of plain sedimentation.

Secondary treatment: brief description of Trickling filters, activated sludge process, Secondary clarifier and Sludge digestion, drying, disposal.

Miscellaneous treatment: septic tank - Imhoff tank - Calculation of dimension of a septic tank from a given data. Sewage disposal - dilution, disposal on lands, oxidation ponds, oxidation ditch, aerated lagoons, anaerobic lagoons. (brief description only)

Sewage recycling: Biogas plants, Drainage and Sanitation in Buildings (brief description): - Sanitary fittings - traps, water closets, flushing cisterns, urinals, inspection chambers, anti-syphonage pipe.

Text / Reference:

T/R	**Book Title/Author**
T1	S.C.Rangwala : Water Supply and Sanitary Engineering ; Charotar Publishing House
R1	Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
R2	K.N.Dugal : Elements of Public Health Engineering ; S.Chand&Co.

R3	Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi 2
R4	Birdie, G. S. and Birdie, J.S.Water Supply and Sanitary Engineering, Dhanpat Rai

Online Resources:

Sl.No	Website Link
1	http://nptel.ac.in/courses
2	http://www.vlab.co.in/ba-nptel-labs-civil-engineering