COURSE NAME : CIVIL ENGINEERING GROUP

COURSE CODE : CE/CR/CS/CV

SEMESTER/YEAR : FIFTH

SUBJECT TITLE : PUBLIC HEALTH ENGINEERING

SUBJECT CODE :

Teaching and Examination Scheme:

Teaching scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	-	02	03	100	25#	-	25@	150

External @ Internal * online examination

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE
- Total of tests for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

RATIONALE :

Public Health Engineering is an integral part of life. It essentially comprises of our ambience, which gives us the zest and verve in all our activities. At present man is facing one of the most horrible ecological crises, the problem of pollution of his environment which sometimes in past was pure, virgin, undisturbed, uncontaminated and basically quite hospitable for him. To maintain better public health one must have safe quality of drinking water supply, effective methods for disposal of domestic and industrial waste and pollution free environment.

The detailed knowledge about various sources of water supply, quality parameters of public water purification and conveyance of water will be useful in planning suitable water supply scheme for town/city. Topics on domestic sewage, conveyance of sewage in sewers analysis and treatment of sewage will be useful for safe disposal of this waste. Topic on industrial waste will be useful in understanding the characteristics of different types of industrial waste and suggest suitable line of treatment for its safe disposal.

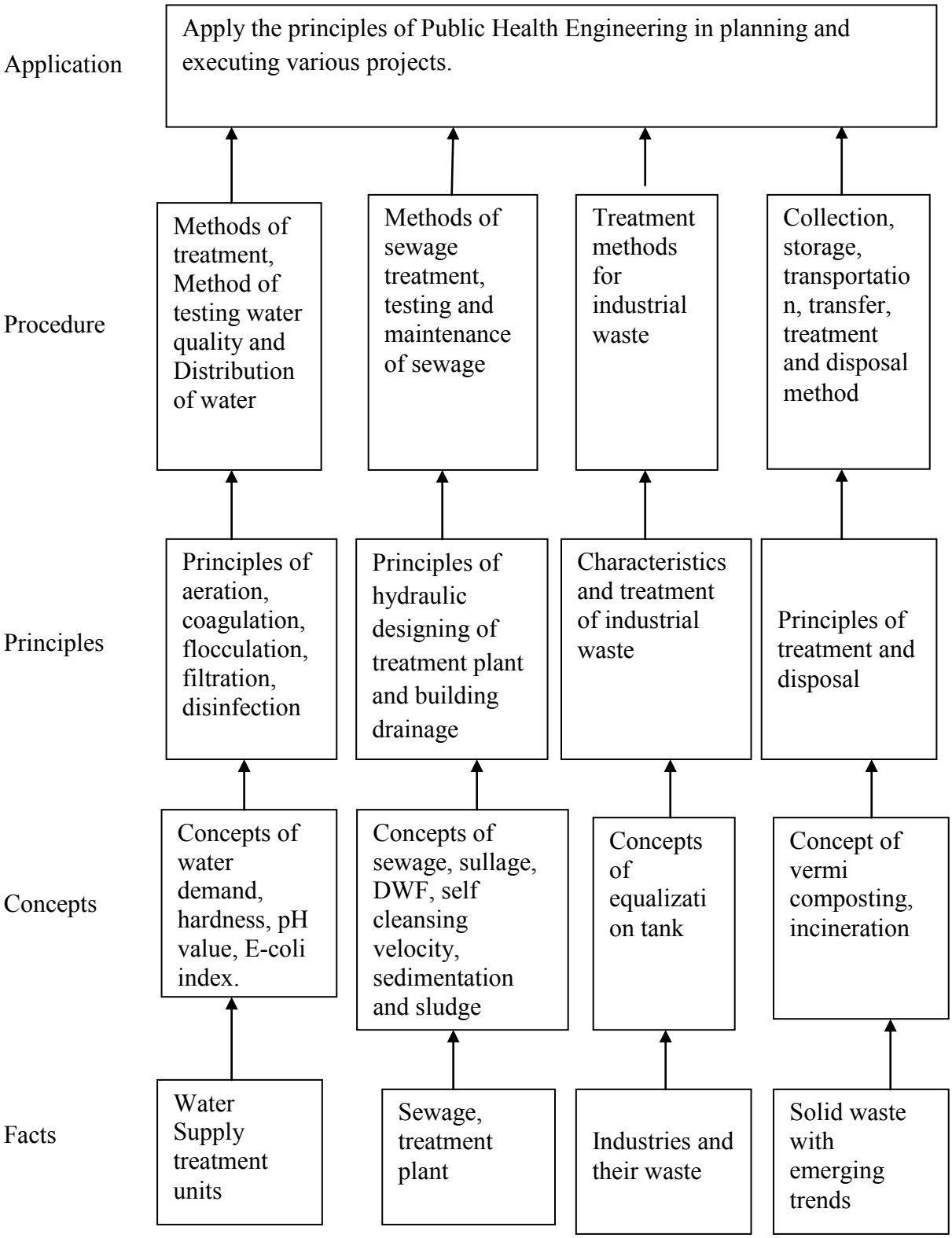
Topic on solid waste will be useful in suggesting suitable methods for collection, treatment and disposal of the same. Emerging trends in sanitation and water supply will provide latest know to the students. Thus the subject will be helpful in bringing up general public health to desired safe level in respect of water supply and disposal of waste.

General Objectives:

The student will able to

1. Understand the terms involved in public water supply, domestic and industrial sewage.
2. Know different types of sources of water for public water supply
3. Understand the methods for estimating
4. Suggest the treatment required by knowing the quality of water
5. Understand the hydraulic design of Units in treatment plant
6. Understand different sewerage systems with their merits
7. Analyze the quality of sewage and suggest suitable treatment of sewage
8. Understand and Draw hydraulic flow diagram of industrial effluent treatment plant
9. Understand method of disposal of solid waste

LEARNING STRUCTURE:



Theory

Topic and Contents	Hours	Marks
Topic 1] Public Water Supply **Specific objectives :** ➢ Draw layout of water supply scheme ➢ Calculate forecasted population ➢ Estimate quantity of water demand ➢ Understand working of water treatment units ➢ Know hydraulic design of water treatment units ➢ Describe functions and locations of different valves on pipes. ➢ Draw layouts of water distribution systems ➢ Draw hydraulic flow diagram of water treatment plant		
1.1 Introduction and Quantity of water……08 Importance of public Health Engineering, Need to protect water supplies, flow diagram of water supply scheme, function of units, Importance of water supply project, Layout of water supply project. Demands 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, Types of water supply schemes.	04	
1.2 Sources and Quality of Water…… 08 Surface and Subsurface sources of water, Intake Structures Definition and types, Factors governing the location of an intake structure, Types of intakes, Water conservation, Ground water recharging – Necessity Importance and advantages Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per I.S.	03	36
1.3Purification of Water…….. 12 Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator, Filtration-theory of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter. Disinfection: Objects, methods of disinfection, Chlorination-Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test, Miscellaneous water Treatments (Water softening, Defluoridation techniques), Advanced Water Treatments (Electrolysis, Reverse Osmosis), Flow diagram of water treatment plants, Low cost water Treatments: Necessity and importance in rural areas, Prevention of	06	

pollution of bores and bore wells.		
1.4 Conveyance and Distribution of water……08 Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. Methods of distribution of water- Gravity, pumping, and combined system Service reservoirs - functions and types , Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system ; their suitability, advantages and disadvantages. **1.5 Domestic appliances ……00** Working of Water Purifier, Working of R.O. domestic plant (Aquagard), Softener, Contents of bottled mineral water (Bislery). **http://en.wikipedia.org/wiki/Bisleri** Questions not to be set on this sub topic	04 01	
Topic 2] Domestic Sewage **Specific objectives :** ➢ State working of sanitary fitting and sewer appurtenances ➢ Draw sketches of sanitary fittings and sewer appurtenances ➢ Calculate the BOD and COD value of sewage ➢ Describe working of water treatment units ➢ Draw hydraulic flow diagram of sewage treatment plant **Contents:** **2.1 Introduction and Building Sanitation…….12** Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage. Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types, qualities of good trap, Systems of plumbing - one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan), inspection and junction chambers, their necessity, location, size and shape. Maintenance of sanitary units.	06	38

2.2 Systems of Sewerage and Sewer Appurtenances…….12 Types of Sewers, Systems of Sewerage. Design of sewers, self cleansing velocity and non scouring velocity Laying, Testing and maintenance of sewers. Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets. **2.3 Analysis and treatment of Sewage…….14** Characteristics of sewage, B.O.D./ C.O.D. and significance. Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank (details and design criteria), Design of septic tank to be done in practical. No numerical questions on design.	04 08	
Topic 3] Industrial Waste **Specific objectives :** ➢ State characteristics of industrial waste ➢ Describe working of different units in effluent treatment plants ➢ Draw hydraulic flow diagram of industrial effluent treatment plant **Contents:** Industrial Wastewater Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments forecasting them.	04	06
Topic 4] Solid Waste from the Society **Specific objectives :** ➢ List the methods of collection, ➢ Describe the method of storage ➢ List the methods of treatment ➢ List the methods of disposal method **Contents:** **4.1 Solid Waste Management** Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Solid waste: Sources, Collection, Methods of collection of solid wastes, Methods of treatment and disposal. **4.2 Hazardous Wastes** Introduction: meaning, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.	04	08
Topic 5] Environmental Sanitation **Specific objectives :** • **Describe construction and working of vermiculture** • **List emerging trends** **5.1 Environmental Sanitation** Necessity and importance, Rural sanitation- Types of Privies – Aqua	03	08

privy and Bore Hole Latrine- construction and working Composting, Vermiculture) **5.2 Emerging Trends (Only Brief Idea)** Sant Gadge Baba Swachhatha Abhiyan, Low cost Latrines, Jalswarajya Scheme. Aircraft Latrine (Vacuumed Toilets) http://en.wikipedia.org/wiki/Aircraft_lavatory		
Topic 6] Plumbing **Specific objectives :** • **Describe of water supply arrangement** • **Describe rainwater and sewage collection system** **Contents:** Line diagram with mountings/pipe specials/traps of water supply arrangement for residential and public building, Sanitary Plumbing, Layout, Rainwater and sewage collection systems, Rainwater harvesting	01	04
Total	**48**	**100**

Practicals:
Skills to be developed

Intellectual Skills:

1. Understand and identify the different methods for testing of water
2. Understand and identify the different methods for analysis of sewage.
3. Interpret the test result

Motor Skills:

1. Observe various chemical and physical reactions
2. Handle instruments carefully
3. Observe the digital reading on display panel
4. Observe and record the reading

List of Practicals:

Water Supply Engineering:

1. To determine pH value of given water sample
2. To determine the turbidity of the given sample of water.
3. To determine residual chlorine in a given sample of water.
4. To determine suspended solids, dissolved solids, and total solids of water sample
5. To determine the dissolved oxygen in a sample of water.
6. To determine the optimum dose of coagulant in the given sample by jar test.

Sanitary Engineering:

1. To determine pH value of given waste water sample.
2. To determine the dissolved Oxygen in a sample of waste water.
3. To determine B.O.D. of given sample of waste water.
4. To determine C.O.D. of given sample of waste water.
5. To determine suspended solids, dissolved solids and total solids of waste water sample.

List of Assignments:

Water Supply Engineering:

1) Visit to water treatment plant

Sanitary Engineering:

1) Design the Septic Tank for the public building such as hostel or hospital. Draw Plan and Section of the same along with the drainage arrangement in soak pit.
2) Visit to sewage treatment plant.

Learning Resources:

1. **Books:**

Sr. No.	Author	Title	Publisher
01	Environmental Engineering (Volume I & II)	Santosh Garg	Khanna Publishers,
02	Environmental Engineering	Kamla A. & Kanth Rao D. L.	Tata McGraw Hill,
03	Water Supply and Sanitary Engineering	Birdie G. S. Birdie J. S.	Dhanpat Rai & Sons
04	Plumbing - Design and Practice	Deolalikar S. G.	Tata McGraw Hill,
05	Industrial Water Treatment	M.N. Rao & R.L Datta	-------
06	Introduction to Environmental Engineering	Mackenzie Davis and David A Cornwell	Tata Mc Graw Hill Education Prvt. Ltd.,Delhi
07	Water Supply and Sanitary Engg	Rangwala	Charotar Publishing House Pvt. Ltd. Anand (Gujrat)

1. **CDs, PPTs Etc.: Video CD on water treatment and sewage treatment, if available.**

2. **IS, BIS and International Codes:**
   1. IS 14543:2004 IS Code for Testing of Drinking Water
   2. IS 8403 : 1977 Code of Practice disposal of Effluent from Septic Tank
   3. D**rinking water** specification (IS 10500:1991)
   4. BIS standard for effluent disposal printed in 1963, revised in 1968

3. **Websites:**
   1. http://en.wikipedia.org/wiki/Bisleri
   2. http://en.wikipedia.org/wiki/Aircraft_lavatory