

Water Supply Engineering

BEG 355 CI

Year: III

Semester: I

Teaching Schedule Hours/week			Examination Scheme						Total Marks
			Final				Internal Assessments		
L T P			Theory		Practical		Theory	Practical	
			Duration	Marks	Duration	Marks			
3	1	2/2	3	80	-	-	20	25	125

Course Objective:

The objective of the course is to provide students with sound knowledge in the water supply system development water treatment technology and its distribution system

Course Contents:

1.0 Introduction

(2 hrs)

- 1.1 Water supply, its objectives, immediate and long term impact
- 1.2 Definition of portable, contaminated and wholesome water.
- 1.3 Major components of water supply systems
- 1.4 Need of water supply engineering
- 1.5 Water supply scheme : Urban and Rural

2.0 Water Sources

(3 hrs)

- 2.1 Surface source: lake, streams/rivers and impounded reservoir. Capacity calculation of impounded reservoir
- 2.2 Underground sources: springs wells and infiltration galleries
- 2.3 Selection of water sources

3.0 Water Supply/Quantity

(5 hrs)

- 3.1 Different types of water demand (domestic, livestock, commercial, industrial and public uses, fire fighting, losses and wastage control measures, per capita demand) and its variation
- 3.2 Definition of design period
- 3.3 Population forecasting methods:
 - 3.3.1 Mathematical method – Arithmetical, geometric/increment increase, decrease rate of growth
 - 3.3.2 Graphical method – extension and comparison
- 3.4 Factors affecting demand of water

4.0 Water Quality

(5 hrs)

- 4.1 Impurities in water ,their classification and effects
- 4.2 Hardness of water ,types of hardness, Alkalinity in waters
- 4.3 Living organism in water: virus, algae, worms and bacteria
- 4.4 Water born diseases: water-born, water-washed, water-based, water-vector, etc.
- 4.5 Physical, chemical and biological analysis of water: tests for temperature, color, odor, taste, turbidity, pH, solids, MPN chloooiform etc
- 4.6 Water quality standard, WHO standard and Nepal standard for domestic use

5.0 Intake Works

(3 hrs)

- 5.1 Site selection for intake
- 5.2 Characteristics of river ,reservoir and springs intakes

6.0 Water Treatment

(14 hrs)

- 6.1 Objectives of water treatment
- 6.2 Treatment Systems:
 - 6.2.1 Screening: Purpose; coarse and fine screens
 - 6.2.2 Plain sedimentation: Purpose, theory of settlement, effect of temperature on settlement, ideal sedimentation tank, design of sedimentation tank, and types of sedimentation tanks
 - 6.2.3 Sedimentation with coagulation: Purpose, types of coagulants, determination of optimum dose of coagulant, flocculation and clarifier

- 6.2.4 Filtration: Purpose, theory of filtration, construction, operation and maintenance of slow sand, rapid sand and pressure filters
- 6.2.5 Disinfection: Purpose chlorination, chlorine dose , residual chlorine, contact time, forms of chlorination, plain chlorination, break-point chlorination, super chlorination, and dechlorination, factors affect in chlorination, ozonation
- 6.2.6 Softening: Removal of temporary hardness by boiling and lime treatment, removal of permanent hardness by lime soda, zeolite and ionization processes.
- 6.2.7 Miscellaneous treatments: Methods of aeration, removal of iron and manganese, and removal of color, odor and taste

7.0 Reservoirs and Distribution System (6 hrs)

- 7.1 Different types of water reservoirs: clear water reservoir, service reservoir, balancing reservoir and determination of the capacity of reservoirs.
- 7.2 System of water supply: continuous and Intermittent, radial, circular ,Grid iron, dead end
- 7.3 Layout of the distribution system
- 7.4 Method of water supply: Gravity and lift
- 7.5 Design of the distribution system

8.0 Conveyance of Water (3 hrs)

- 8.1 Different types of pipe: CI GI, WI, Steel, concrete, AC and PVC
- 8.2 Laying of pipes
- 8.3 Pipe joints and their types

9.0 Valves and Fittings (4 hrs)

- 9.1 Different types of valves: sluice valve, reflux valve, safety valve, air valve and drain valve
- 9.2 Different types of pipe fittings: stop cocks, nipples, sockets, joint coupling water taps and bends.
- 9.3 Public stand post and break pressure tank
- 9.4 Operation and Maintenance of the water supply system

Laboratories:

Five laboratory exercises will be performed in this course. These are:

- (a) Physical tests of water: temperature, color, turbidity, and PH.
- (b) Determination of suspended, dissolved and total solids in water.
- (c) Determination of dissolved oxygen in water by Winkler method and D.O. meter.
- (d) Determination of optimum doses of coagulant by the jar test.
- (e) Micro-biological test of water

Field Visit:

Field visit of water supply systems, group presentation and submission of individual report to the respective teacher.

References:

- P.N.Modi, Water supply Engineering , Standard book house
- B.C.Punimia, Water supply Engineering, Laxmi Publication-+
- G.S. Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons Publishers.