Sanitary Engineering
BEG 364 CI

Year: III **Semester: II**

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

Course Objective:

The course aims at providing the students with a fairly advanced knowledge of the sewerage system, sludge treatment and its disposal

Course Contents:

1.0 Introduction (2 hrs)

1.1 Importance of waste water and solid waste management
1.2 Objects of sewage disposal
1.3 Sanitation systems: conservancy system and water carriage system
1.4 Types of sewerage systems: combined, separate and partially separate systems

2.0 Quantity of waste water (3 hrs)

2.1 Sources of sanitary sewage
2.2 Factors affecting sanitary sewage
2.3 Determination of quantity of sanitary sewage
2.4 Methods of determination the quantity of storm water: tangent method; limitation of rational method

3.0 Characteristics and Examination of Sewage (5 hrs)

3.1 Sewage sampling
3.2 Different characteristics of sewage: physical, chemical and biological.
3.3 Decomposition of sewage, aerobic and anaerobic reactions
3.4 Biochemical oxygen demand (BOD) and chemical oxygen demand (COD)
3.5 Tests, of solids, DO, pH-value, brief review of, water supply, BOD, COD, Nitrogen, chloride demand, chloride

4.0 Design and Construction of Sewers (5 hrs)

4.1 Typical design periods, flow velocity, flow diagrams, hydraulic formulae and gradients
4.2 Shape of sewers
4.3 Sewer materials: requirements, salt glazed stoneware, C.I. and cement concrete pipes
4.4 Design of the sewer for separate and combined systems
4.5 Construction of sewer: excavation, laying, joining of sewer testing of sewer: water test, air-test

5.0 Sewer Appurtenances (4 hrs)

5.1 Manholes, drop-manholes and lamp-holes
5.2 Street inlets
5.3 Catch basins
5.4 Flushing devices
5.5 Sand, Grease and oil traps
5.6 Inverted siphons
5.7 Sewer outlets
5.8 Ventilating shaft

6.0 Sewage Disposal (6 hrs)

6.1 Meaning and objects of sewage disposal
6.2 Disposal of sewage by dilution: Process, essential conditions for dilution, Self-purification of streams, factors affecting self-purification, oxygen sag curve, Streeter-Phelps equation
6.3 Disposal of sewage by land treatment: process, suitability of land treatment, methods of land treatment irrigation, over land flow and rapid filtration

7.0 Sewage Treatment (10 hrs)

7.1 Objects of treatment and different treatment methods: physical, chemical, biological
7.2 Preliminary treatment processes: racks or screens, skimming tanks, grit chamber, sedimentation, and chemical precipitation
7.3 Secondary treatment processes and their types
7.4 Principles of biological treatment, principal of suspended and attached growth process
7.5 Sewage filtration, intermittent sand filler, contact bed tricking filters, bio filters and design of trickling and bio-filters
7.6 Activates sludge process: theory, design and aeration, advantages and disadvantages of the activated sludge process
7.7 Oxidation ponds: functions, theory and design

8.0 Sludge Treatment and Disposal (4 hrs)

8.1 Sources of sludge and need of treatment
8.2 Aerobic and anaerobic digestion
8.3 Methods of sludge treatment: grinding and blending , thickening, stabilization, dewatering, drying, compositing and incineration
8.4 Methods of sludge disposal: spreading on land, lagooning, dumping, and land filling

9.0 Disposal of Sewage from Isolated Buildings (4 hrs)

9.1 Privies: Pit privy, ventilation improved pit latrine, and pour-flush latrine
9.2 Septic Tank: design, construction, working and maintenance
9.3 Disposal of septic tank effluent: drain field, soak pits, watching, Evapotranspiration mounds

10.0 Solid Waste Cesspools and Evapotranspiration Mounts (2 hrs)

10.1 Types and characteristics of solid waste
10.2 Collection and disposal

10.3 Methods of solid waste disposal: dumping, sanitary landfill, incineration and composting

Laboratories:

(i) BOD and COD tests.

(ii) Bacteriological: Membrane filter, most probable number.

Field Visit:

Field visit of a sewerage treatment plant, group presentation and submission of individual report to the respective teacher.

References:

- B.C. Punmiya, Sanitary Engineering, ,Laxmi publisher
- P.N Modi, Sanitary Engineering, Standard book house
- G.S. Bridie, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons Publishers