

Sanitary Engineering
EG 3105 CE

Year: III
Semester: I

Total: 4 Hrs. /week
Lecture: 3 Hrs./week
Tutorial: 1 Hr./week
Practical: Hrs./week
Lab: Hrs./week

Course Description:

The course aims at developing fundamental knowledge of sanitary engineering such as sewerage system, preliminary sewage treatment system, on site sanitation systems and solid waste management.

Course Objectives:

After completion of the course, the students will be able to:

1. Introduce sanitation and health, main diseases transmitted due to unsanitary excreta disposal;
2. Explain the process of wastewater collection, conveyance, treatment and disposal methods and design of sewers;
3. Be familiar/Familiarize with the fundamental problems, issues related to wastewater and its management;
4. Describe the onsite sanitation systems and
5. Explain the importance and methods of solid waste disposal.

Course Contents:

Unit 1: Sanitation and health

[6 Hrs.]

- 1.1. Introduction
- 1.2. Main diseases transmitted by unsanitary excreta disposal
- 1.3. Transmission routes
- 1.4. Preventive measures
- 1.5. Importance of sanitation, awareness of public health engineering
- 1.6. Definitions of common terms used in sanitary engineering
 - 1.6.1. Sewage/wastewater, domestic sewage, industrial sewage, sanitary sewage, storm water
 - 1.6.2. Sullage, sewer, sewerage, rubbish, garbage, refuse and solid waste
- 1.7. System of sanitation
 - 1.7.1. Conservancy system with merits and demerits
 - 1.7.2. Water carriage system with merits and demerits
- 1.8. Sewerage systems and types
 - 1.8.1. Separate system
 - 1.8.2. Combined system
 - 1.8.3. Partially separate system
 - 1.8.4. Comparison in tabular form between separate and combined systems

Unit 2: Quantity of Sewage:

[4 Hrs.]

- 2.1. Sources of sanitary sewage
- 2.2. Dry Weather Flow (DWF) and Wet Weather Flow (WWF)
- 2.3. Factors affecting quantity of sanitary sewage
 - 2.3.1 Population
 - 2.3.2 Rate of water supply

- 2.3.3 Groundwater infiltration
- 2.3.4 Unauthorized connections
- 2.4. Determination of quantity of sanitary sewage -, peak factor, peak flow, minimum and maximum flows
- 2.5. Determination of quantity of storm water- Rational method and its limitation, Overall runoff coefficient, intensity of rainfall, Time of concentration
- 2.6. Numerical on determination of quantity of wastewater for separate, combined and partially separate systems

Unit 3: Design and Construction of Sewers: [4 Hrs.]

- 3.1. Shapes of sewer-Circular and non-circular sections with merits and demerits
- 3.2. Sewer Materials
 - 3.2.1. Requirement of sewer materials
 - 3.2.2 Types of sewer materials - salt glazed stoneware, cement concrete, cast iron
- 3.3. Design criteria of sewers - design period, minimum and maximum velocities, self-cleansing velocity, sewer size range, sewer gradient
- 3.4. Hydraulic formulae for design Manning's, Chezy's and Hazen Williams formulae, hydraulic elements of circular sewers for partial flow condition, partial flow diagrams
- 3.5. Numerical on design of circular and rectangular sewers

Unit 4: Sewer Appurtenances (only introduction): [4 Hrs.]

- 4.1. Necessity of sewer appurtenances
- 4.2. Construction of sewer appurtenances- (location, function and construction)
 - 4.2.1. Manhole
 - 4.2.2. Drop manhole
 - 4.2.3. Street inlets
 - 4.2.4. Catch basin
 - 4.2.5. Flushing device
 - 4.2.6. Inverted siphon
 - 4.2.7. Ventilating shaft
 - 4.2.8. Water closet
 - 4.2.9. Trap
 - 4.2.10. Sand, grease and oil traps

Unit 5: Sampling and Characteristics of Wastewater (introduction only): [3 Hrs.]

- 5.1. Sampling of wastewater - grab and composite samples
- 5.2. Biochemical Oxygen Demand (BOD)
- 5.3. Chemical Oxygen Demand (COD)
- 5.4. Decomposition of wastewater-process, aerobic and anaerobic decomposition, reactions
- 5.5. Wastewater disposal Standards

Unit 6: Wastewater Disposal: [5 Hrs.]

- 6.1. Necessity and objectives of wastewater disposal
- 6.2. Wastewater disposal by Dilution process and essential conditions for dilution
- 6.3. Self-purification of rivers/streams and sag curve
- 6.4. Factors affecting self-purification - Dilution, Current, Sunlight, Sedimentation, Temperature, Oxidation, Reduction

- 6.5. Wastewater disposal by land treatment and Suitability of land treatment
- 6.6. Methods of land treatment - irrigation, overland flow and rapid infiltration, Broad irrigation and sewage farming, Methods of application of sewage on land - flooding, surface irrigation, ridge and furrow method, subsurface irrigation and spray irrigation
- 6.7. Sewage sickness and its prevention

Unit 7: Wastewater Treatments:

[9 Hrs.]

- 7.1. Objectives
- 7.2. Treatment process types and impurity removal
- 7.3. Primary treatment process
 - 7.3.1. Racks and Screens - purpose and types, design criteria, construction, working and maintenances
 - 7.3.2. Skimming tank – purpose and types, design criteria, construction, working and maintenances
 - 7.3.3. Grit chamber - purpose and types, design criteria, construction, working and maintenances
- 7.4. Waste stabilization pond - purpose and types, design criteria, construction, working and maintenances
- 7.5. Constructed wetland - purpose and types, design criteria, construction, working and maintenances
- 7.6. Numerical on design of Racks and Screens, Skimming tank, Grit chamber, Waste stabilization pond and Constructed wetland

Unit 8: On site Sanitations for Isolated / Unsewered Area:

[8 Hrs.]

- 8.1. Necessity
- 8.2. On site sanitation - Definition and types
- 8.3. Pit privy - purpose and construction
- 8.4. Ventilated Improved Pit (VIP) latrine - purpose, construction, design criteria (single pit only)
- 8.5. Compost latrine- purpose and types, design criteria, construction, working and maintenances
- 8.6. Septic tank - purpose, construction, design criteria, working and maintenance
- 8.7. Disposal of septic tank effluent methods
- 8.8. Drain field - purpose, construction and design criteria
- 8.9. Soak pit - purpose, construction and design criteria
- 8.10. Leaching cesspool - purpose
- 8.11. Numerical on design of VIP latrine, Septic tank and Soak pit

Unit 9: Solid Waste Disposal:

[2 Hrs.]

- 9.1. Characteristics of solid waste
- 9.2. Quantity of solid waste
- 9.3. Collection and transportation of solid waste
- 9.4. Methods of solid waste disposal
 - 9.3.1. Dumping
 - 9.3.2. Sanitary landfill
 - 9.3.3. Incineration
 - 9.3.4. Composting

Tutorials:

- 1. Introduction** [1 Hr.]
Definitions
- 2. Quantity of Wastewater** [2 Hrs.]
Definitions, Numerical on determination of sanitary sewage and storm water, determination on quantity of wastewater for separate, combined and partially separate systems
- 3. Design and Construction of Sewers** [2 Hrs.]
Design criteria of sewers, partial flow conditions in sewers, Numerical on design of circular and rectangular sewers for separate and combined systems
- 4. Sewer Appurtenances** [2 Hrs.]
Definitions and sketches
- 5. Sampling and Characteristics of Wastewater** [1 Hr.]
Definitions, standards
- 6. Wastewater Disposal** [1 Hr.]
Definitions, drawing sag curve
- 7. Wastewater Treatment** [2 Hrs.]
Numerical on design of Racks and Screens, Skimming tank, Grit chamber, Waste stabilization pond and Constructed wetland
- 8. Disposal of Sewage from Isolated Buildings** [3 Hrs.]
Definitions, Numerical on design of VIP latrine, Pour flush latrine, Septic tank and Soak pit
- 9. Solid Waste Disposal** [1 Hr.]
Definitions, purpose, classification

References:

1. B. C. Punmia and Ashok Jain, "Wastewater Engineering", Laxmi Publications (P) Ltd., New Delhi
2. P.N. Modi, "Sewage Treatment & Disposal and Wastewater Engineering", Standard Book House, Delhi.
3. G.S. Birdie and J, S, Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai Publishing Company (P) Ltd., New Delhi
4. K.N. Duggal, "Elements of Environmental Engineering", S. Chand and Company Ltd., New Delhi.

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Title	Hrs. (L+T)	Marks distribution
1	Introduction	6+1=7	8
2	Quantity of Wastewater	4+2=6	8
3	Design and Construction of Sewers	4+2=6	8
4	Sewer Appurtenances	4+2=6	8
5	Sampling and Characteristics of Wastewater	3+1=4	4
6	Wastewater Disposal	5+1=6	8
7	Wastewater Treatment	9+2=11	16
8	Disposal of Sewage from Isolated Buildings	8+3=11	16
9	Solid Waste Disposal	2+1=3	4
	Total	60	80

*There may be minor variation in marks distribution.

The questions setting should be in the multiplication of 4

Construction Management EG 3106 CE

Year: III
Semester: I

Total: 6 Hrs./week
Lecture: 5 Hrs./week
Tutorial: 1 Hr./week
Practical: Hrs./week
Lab: Hrs./week

Course Description

This course focuses on management of construction works. This course imparts knowledge on organization, Management, labor relations, safety, accounts, procurement of works, contract management, planning, scheduling, monitoring and control, and managing construction works.

Course Objectives

After completion of this course, students will be able to:

1. Familiarize the need of organization, and account;
2. Describe construction management;
3. Plan and schedule different activities of construction project;
4. Familiarize with monitoring and control, labor relations, and safety in construction works;
5. Familiarize with the procurement of works and contract administration; and
6. Plan and schedule resources required in construction project.

Course Content

Unit 1: Organization and Management

[8 Hrs.]

- 1.1 Definition and need of organization
- 1.2 Types of organization - Line organization, Line and staff organization, and Matrix organization.
- 1.3 Definition and importance of Management
- 1.4 Principles of Management
- 1.5 Human Resource Management
- 1.6 Motivation
- 1.7 Definition and Need of Construction Management

Unit 2: Bookkeeping and Account

[6 Hrs.]

- 2.1 Definition of Bookkeeping
- 2.2 Need and Importance of Accounting
- 2.3 Principle of Double Entry - Personnel account, Property or Real account, and Nominal account
- 2.4 Introduction to Journal, Ledger and Final account

Unit 3: Project Planning and Scheduling

[12 Hrs.]

- 3.1 Definition and Characteristics of Project
- 3.2 Definition and Steps of Planning
- 3.3 Importance of Planning
- 3.4 Construction Site Planning
- 3.5 Work Breakdown Structure