

### 3/4 B.Tech. SIXTH SEMESTER

CE6T4

ENVIRONMENTAL ENGINEERING – II

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

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#### Objectives:

- To know types of Sanitation, sewages, sewers and sewer appurtenances
- To design the treatment unit for domestic waste water and its disposal.
- To know the solid waste management at primary level.

#### Learning outcomes:

After the exposure to the subject, student knows

- The importance of sanitation.
- Analysis of sewage characteristics.
- How to treat sewage using various treatment units before disposal.
- Different methods of sewage disposal.

#### UNIT-I

##### INTRODUCTION TO SANITARY ENGINEERING:

Sanitation- Conservancy and water carriage system-Sewerage systems- Relative merits  
Quantity of sanitary sewage- Factors- storm water sewage- factors- Determination of  
quantity of storm water sewage.

#### UNIT-II

##### SEWERS, SEWER APPURTENANCES, SEWAGE PUMPING:

Types of sewers- Design of sewers- Construction- Testing- Maintenance of sewers  
Sewer appurtenances – Man holes -Flushing tanks- Inverted siphons-Catch basins-  
Storm water regulators-Sewage pumping-Types of pumps

#### UNIT – III

##### QUALITY AND CHARACTERISTICS OF SEWAGE:

Characteristics of sewage- Decomposition of sewage-Carbon, nitrogen and sulphur  
cycles of decomposition- BOD- COD- Physical and chemical analysis of sewage.

#### UNIT-IV

##### PRIMARY TREATMENT OF SEWAGE:

Screens-Grit chamber- Grease traps- Skimming tanks- Sedimentation tanks- Septic  
tank- Design criteria of septic tank- Septic tank effluent disposal- soak pit Leaching cess  
pool- Dispersion trenches.

#### UNIT-V

##### SECONDARY TREATMENT OF SEWAGE:

Trickling filters- Principles - Filter types; Recirculation; Final settling tanks; Operational  
problems and remedies- Activated sludge process- Principles- Activated sludge process  
vs Trickling filter process- operations- Organic loading parameters; Methods of aeration-  
Diffused air system- Mechanical aeration- Combined system- Sludge bulking- Sludge  
volume index.

#### UNIT-VI

**SEWAGE DISPOSAL:**

Objects- Methods- Disposal by dilution- Self purification process- Oxygen sag- Zones of pollution of river- Disposal by irrigation- Sewage sickness- Reuse of treated sewage.

**UNIT – VII****SLUDGE TREATMENT:**

Characteristics of sewage sludge- Anaerobic sludge digestion process- Stages of sludge digestion- Factors affecting sludge digestion;

**UNIT-VIII****SLUDGE DISPOSAL:**

Sludge digestion tank- High rate digestion- Sludge thickening- Sludge conditioning- Methods of dewatering the sludge- Methods of sludge disposal.

**Learning resources****Text books:**

1. Elements of public health engineering by Duggal K.N., S. Chand & Company Ltd., New Delhi, 1995.
2. Environmental Engineering vol. II- Sewage disposal and air pollution engineering by Garg S. K., Khanna Publishers, Delhi, 2010.
3. Environmental pollution control engineering by Rao C. S., Wiley Eastern Limited, New Delhi, 2007.

**Reference books:**

1. Wastewater Engineering Treatment by Met Calf and Eddy, Disposal & Reuse, Tata McGraw – Hill, 2002.
2. Water & Wastewater Technology by Mark Hammer J., John Wiley & Sons, 2008.
3. Sewerage and sewage treatment by Shirasagar S.R., Roorkee Publishing House, Roorkee, 1968.
4. Manual on Sewerage & Sewage treatment by CPH and EEO, Ministry of Works and Housing; Govt. of India, New Delhi, 2012.

**Web Reference books: NPTEL**