3/4 B.Tech. SIXTH SEMESTER

CE6T4 ENVIRONMENTAL ENGINEERING-II Credits: 3

Lecture: 3 periods/week Internal assessment: 30 marks

Tutorial: 1 period /week Semester end examination: 70 marks

Pre-requisites: Environmental engineering I

Learning 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.

Course outcomes:

After the exposure to the subject, student is able to:

1. Identify the importance of Sanitary Engineering.
2. Analyze and conduct different sewage characteristics.
3. Treat the sewage by using various treatment units before disposal.
4. Analyze the sludge characteristics and treat by different methods.
5. Evaluate existing scenario of solid waste management in India

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.

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

UNIT-II

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.

PRIMARY TREATEMNT 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-III

SECONDARY TREATEMNT OF SEWAGE

Trickling filters- Principles - Filter types- low rate Trickling filter-high rate trickling filter Recirculation; Final settling tanks; Operational problems and remedies

ACTIVATED SLUDGE PROCESS

Principles- Activated sludge process vs Trickling filter process- operations- Organic loading parameters-Aeration- Diffused air system- Mechanical aeration- Combined system- Sludge bulking-Sludge volume index-

UNIT- IV

SEWAGE DISPOSAL

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

SLUDGE TREATEMENT

Characteristics of sewage sludge- Anaerobic sludge digestion process- Stages of sludge digestion- Factors affecting sludge digestion- Sludge digestion tank- High rate digestion- Sludge thickening- Sludge conditioning Methods of dewatering the sludge- Methods of sludge disposal.

UNIT - V

SOLID WASTE MANAGEMENT

Municipal Solid Wastes: Characteristics-generation- collection- Methods of collection-equipment-types of vehicles-man power requirement-collection routes.

TRANSFER AND TRANSPORTATION OF SOLID WASTE

Need for Transfer operations-Transfer Stations-Selection of Location of Transfer Station-Transport means and methods-Engineered systems for solid waste management - recycle energy recovery-treatment and 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.

e-learning resources:

NPTEL