**17CE4102 – ENVIRONMENTAL ENGINEERING -II**

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| **Course Category**  | Professional Core | **Credits**  | 4 |
| **Course Type**  | Theory | **Lecture - Tutorial - Practical**  | 3 - 2 - 0 |
| **Prerequisite**  | Environmental Engineering-I | **Sessional Evaluation**  | 40 |
| **Semester End Exam Evaluation**  | 60 |
| **Total Marks**  | 100 |

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| **Course Objectives** | 1. To understand about the source of wastewater and hydraulic design of sewers depending upon the different sewer materials
2. To understand about the characteristics of wastewater mainly about BOD and its importance in wastewater analysis.
3. To understand about the functions, design of each unit in the conventional treatment plant.
4. To understand about the characteristics of different types of sludges and different sludge treatment processes.
5. To understand about different tertiary treatment methods.
6. To understand about the effluent disposal methods and self-purification capacity of natural water streams.
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| **Course Outcomes** | CO1 | Identify the sources of wastewater and materials for sewer design. |
| CO2 | Determine the characteristics of domestic wastewater. |
| CO3 | Explain the principles and design of preliminary, primary treatment of domestic wastewater. |
| CO4 | Explain the principles and design of secondary treatment of domestic wastewater. |
| CO5 | Explain the sludge processing and management and importance of the tertiary sewage treatment. |
| CO6 | Demonstrate the principles of waste disposal. |
| **Course****Content** | **UNIT – I****WASTEWATER COLLECTION AND ESTIMATION:** Sanitation **–** Systems of sanitation Sewerage – Systems of sewerage – Sources of wastewater – Sewage and storm water estimation **–** Hydraulic design of sewers – Different materials used for sewers – Shapes of sewer – Sewer appurtenances.**UNIT – II****CHARACTERISTICS OF DOMESTIC WASTEWATER:** Characteristics of sewage –Physical, chemical and biological –BOD equation –Factors affecting the BOD rate of reaction Population equivalent –Relative stability.**UNIT – III****PRELIMINARY AND PRIMARY SEWAGE TREATMENT:** Layout and general outline of wastewater treatment plant –Function of each unit –Principles and design of screens –Grit chambers –Primary setting tanks.**UNIT – IV****SECONDARY SEWAGE TREATMENT:** Principles and nutritional requirement of biological treatment system –Factors affecting biological treatment –Working principles and constructional details of High Trickling filter –Activated sludge process –Oxidation/Stabilization pond –Oxidation ditch.**UNIT – V****SLUDGE MANAGEMENT:** Sludge –Characteristics and types – Sludge treatment –Thickening **–**Stabilization –Conditioning –Dewatering –Drying/Incineration – Sludge utilization and disposal.**TERTIARY SEWAGE TREATMENT:** Removal of nitrogen and phosphorus –Refractory organic –Heavy metals –Suspended solids and pathogenic bacteria. **UNIT – VI****EFFLUENT DISPOSAL:** Methods – Dilution – Self-purification of surface water bodies –Oxygen sag curve –Marine disposal –Land disposal –Sewage farming Working principle and design of septic tank – Septic tank effluent disposal system –Disposal standards.  |
| **Textbooks****and****References** | **TEXTBOOKS:**1. Sewage Disposal and Air Pollution Engineering by S.K. Garg. 2. Wastewater Engineering by B.C.Punmia. 3. Waste Water Treatment For Pollution Control by Arceivala S J. **REFERENCE BOOKS:** 1. Water Supply and Sanitary Engineering by G. S. Birdie & J. S. Birdie. 2. Environmental Engineering by H.S. Peavy et al. 3. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf and Eddy.  |