

**Module-1**

**Chapter 1 : Waste Water Generation, Collection and Conveyance 1-1 to 1-82**

**Syllabus :** *Introduction : Domestic waste water, Industrial Wastewater and Storm water, Conservancy and Water carriage system, Systems of sewerage, Quantity and Quality of Wastewater.*

*Need for Analysis, Characteristics of wastewater : Analysis of wastewater, Characteristics of wastewater and sampling, Composition, Biochemical characteristics, aerobic decomposition, anaerobic decomposition,*

*Waste Water Treatment and Flow diagram : Treatment processes : Objective, methods of treatment, flow sheets showing Preliminary, Primary, Secondary and Tertiary treatment. Waste Water Treatment Plant and Effluent Treatment Plants. Various combinations and options. Low-cost treatment plant..*

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**Module-2**

**Chapter 2 : Introduction to Biological Treatment**

**2-1 to 2-47**

**Syllabus :** *Overview of biological wastewater treatment, objectives of the treatment, role of microorganisms, types of biological processes for wastewater treatment, suspended and attached growth systems.*

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**Module-3**

**Chapter 3 : Microbial Growth Kinetics 3-1 to 3-7**

**Syllabus :** Microbial Growth Kinetics terminology, rate of utilization of soluble substrates, rate of biomass growth with soluble substrate, rate of oxygen uptake, effects of temperature, total volatile suspended solids and active biomass, net biomass yield and observed yield.

Biotechnological remedies : Bio-fertilizers, Physical, chemical and Microbiological factors of composting, Health risk-Pathogens, Odor management, Microbial cell/enzyme technology, Adapted microorganisms, Biological removal of Nutrients.

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**Module-4**

**Chapter 4 : Aerobic Decomposition 4-1 to 4-25**

**Syllabus :** Aerobic Suspended Growth Biological Treatment Systems : Aerobic biological oxidation, process description, environmental factors, Modifications of ASP: Complete Mix activated sludge, Extended Aeration system, Oxidation Ditch systems, Oxygen activated sludge, Oxidation ponds, Stabilization ponds, Aerobic attached Growth Biological Treatment-Trickling Filter.

Design of ASP : Trickling Filter, Oxidation Pond, Oxidation Ditch and Aerated lagoons.

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**Module-5**

**Chapter 5 : Anaerobic Decomposition 5-1 to 5-12**

**Syllabus** : *Anaerobic Decomposition : Mechanism of anaerobic fermentation – a multistep process, Microbiology and Biochemistry of Anaerobic processes, Substrate inhibition, Stuck reactors, Standard rate, High rate and Multistage anoxic digesters. Introduction to UASB.*

*Design of anaerobic treatment units : Anaerobic Lagoons*

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**Module-6**

**Chapter 6 : Natural and Biotechnological Methods of Removal Contamination 6-1 to 6-6**

**Syllabus :** *Natural Treatment Systems: Development of natural treatment systems, Rapid infiltration systems, Overland Flow systems, constructed wetlands, Floating aquatic plant treatment systems. Introduction to engineering Fundamentals of Biotechnology. Heavy Metal Removal using advance treatment methods – Membrane filtration, Reverse Osmosis and Ion exchange.*

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