

<b>Devi Ahilya University, Indore, India Institute of Engineering &amp; Technology</b>			
<b>Subject Code and Name</b>	<b>Type</b>	<b>L-T-P</b>	<b>Credits</b>
<b>VLR7E1: Environmental Engineering – II</b>	<b>L</b>	<b>T</b>	<b>P</b>
	<b>PC</b>	<b>3-1-1</b>	<b>4+1(P)</b>

## **COURSE CONTENTS**

### **Unit I : Sewage And Sewerage Engineering**

Definition & Classification of Sewage - Quantity of Sanitary Sewage and Storm Water – Fluctuations in Flow Pattern – Design Flow of Sewage – Physio-chemical and Biological Characteristics – Assessment of Organic Solids by BOD, COD, TOC, ThOD, & TOD – Microbiology of Sewage – Systems and Layouts of Sewerage – Analysis and Design of Sewers under Different Flow Situations - Sewer Sections – Materials for Sewers – Laying, Jointing, and Testing of Sewers – Appurtenances and Maintenance - Pumping of Sewage and Pumping Stations.

### **Unit II : Preliminary And Primary Treatments Of Sewage**

Principles and Objectives of Sewage Treatment – Operation and Design of Bar Rack and Grit Chamber with Velocity Control Devices – Principles of Primary Treatment and Design of Primary Sedimentation Tank – Disposal of Rackings, Gritty Materials, and Sludge Solids.

### **Unit III : Biological Treatment Processes**

Objectives of Biological Treatment – Path Ways of Decomposition – Aerobic, Anaerobic, and Anoxic Processes – Operation & Design of Conventional Activated Sludge Process with Diffuser and Mechanical Aerators – Process Modifications – Analysis and Design of Trickling Filter – High rate and Standard Rate Filters – Low Cost Waste Water Treatments – Principles and Design of Stabilization Ponds, Oxidation Ponds and Aerated Lagoons – Rural Sanitation – Operation and Design of Septic and Imhoff Tanks – Excreta Disposal Schemes.

### **Unit IV : Engineering Methods Of Sludge Disposal**

Objectives of Sludge Disposal – Types and Characteristics of Sludges in a Typical Treatment Plant – Operation and Design of Sludge Digestions – Energy Recovery Aspects regarding Methane Production – Sludge Lagooning, Unconventional Methods of Disposal - Disposal of Sewage by Dilution in Streams, Rivers, and Estuaries – Self-purification and Oxygen Sag-curve Analysis – Trophic Status of Aquatic Bodies.

### **Unit V : Advanced Waste Water treatment**

Diatomaceous earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

### **Reference Books :-**

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company
2. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
3. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
4. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company
5. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
7. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi