

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENVIRONMENTAL ENGINEERING**

**Course Code: GR20A3083**

**L/T/P/C: 2/0/0/2**

**III Year II Semester**

**Pre-Requisites:** Engineering Chemistry, Environmental Science.

**Course Objectives:**

1. Identify opportunities in environmental engineering field.
2. Identify, formulate and solving problems on analysis of water.
3. Predict the population in a city such that design of water treatment plant and quantity of water required can be estimated.
4. Assess various techniques in treatment of water and wastewater.
5. Identify methods of disposal of sewage and their impact on environment

**Course Outcomes:**

1. Analyze characteristics of water and wastewater.
2. Assess water demand and design components of water distribution systems.
3. Design conveyance elements of wastewater collection systems.
4. Assess sources of water and wastewater.
5. Plan and design water treatment units and wastewater treatment systems.

**UNIT I**

**Sources, Quality and Quantity Perspectives of Water:** Surface sources, subsurface sources, physical, chemical and biological characteristics, BIS standards for potable water, Estimation of water demand, water consumption rate, fluctuations in rate of demand, design period, population forecasting methods. Collection and Conveyance of Water, Intakes, types of Intakes.

**UNIT II**

**Water Pollution:** Types of pollutants, their sources and impacts.

**Water Treatment:** Layout and general outline of water treatment units, screening, plain sedimentation, sedimentation aided with coagulation, filtration, disinfection, water softening, miscellaneous treatments. Design of Clarifiers, working of slow and rapid gravity filters, multimedia filters.

**UNIT III**

**Distribution Systems:** Requirements of a good distribution system, methods of distribution, systems of supply of water, Distribution reservoirs, layout of distribution system, design of distribution system, analysis of pipe networks, appurtenances in distribution system- Joints, Valves and Water Meters.

**UNIT IV**

**Quality and Quantity Perspectives of wastewater:** Physical, chemical and biological characteristics of wastewater, analysis of wastewater, Importance of BOD and COD, Effluent standards, BIS for disposal of Industrial Waste water, impacts of disposal, Wastewater Collection, Estimation of dry weather flow and stormwater flow.

## UNIT V

**Primary Treatment of wastewater:** Preliminary & primary treatment of wastewater: screening, grit removal basins, removal of oil and grease, sedimentation, sedimentation aided with coagulation.

**Secondary Treatment of wastewater:** Principles and classification of secondary treatment, activated sludge process, trickling filters, miscellaneous methods such as oxidation ditch, oxidation ponds, aerated lagoons, rotating biological contractors. Disposal of wastewater, self-purification of streams, sewage irrigation, BIS standards for waste water irrigation, Treatment and disposal of sludge, On-site disposal methods.

**Tertiary Treatment of wastewater:** Principles and classification of Tertiary treatment

### TEXTBOOKS:

1. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi., 2<sup>nd</sup> edition- 2016.
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers- 3<sup>rd</sup> edition-1996.
3. P.N. Modi(2008), Sewage treatment & Disposal and waste water Engineering-Environmental Engineering (Vol.II) – Standard Book House, 5<sup>th</sup> edition, 2018.
4. S.K. Garg (1999), Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol.II) – Khanna Publishers.

### REFERENCES:

1. Water and Waste Water Technology by Mark J Hammer and Mark J. Hammer Jr., Pearson 7<sup>th</sup> edition, 2011
2. Water and Waste Water Engineering by Fair, Geyer and Okun- Wiley, 3<sup>rd</sup> edition, 2010.
3. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India., 2013.
4. Wastewater Engineering by Metcalf and Eddy., 5<sup>th</sup> edition-2013.
5. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International, 1997.