|| Jai Sri Gurudev||
Sri Adichunchanagiri Shikshana Trust (R)
ADICHUNCHANAGIRI UNIVERSITY
BGS Institute of Technology

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

18CV62	**Course Code**	**WATER AND WASTE WATER ENGINEERING**	**Course Title**	**VI**	**Semester**
4	**Credits**	**3 – 1 – 0 – 4**	**L – T – P –TL***	**50 Hours**	**Teaching Period**
100 Marks	**Total**	**60 Marks**	**SEE***	**40 Marks**	**CIE***
***NOTE: L** – Lecture; **T** – Tutorial; **P** – Practical; **TL** – Total; **CIE** – Continuous Internal Evaluation; **SEE** – Semester End Examination					

Course Learning Objectives: This course will enable students to 1. Analyze variation in water demand Evaluate conveyance systems for raw and treated water. 2. Design primary and secondary treatment methods to ensure safe and potable water Supply. 3. Estimated the quantity of wastewater generation and understand sewerage network 4. Evaluate self-purification of streams depending on hydraulic and organic loading of sewage into receiving waters 5. Understand and design different unit operations involved in primary and secondary wastewater treatment process .	**Teaching Hours4**
Module-1 **Water Demand & Conveyance** Introduction: Need for protected water supply. Demand of Water, Factors affecting per capita demand, Peak factor, Design period and factors governing design period. Different methods of population forecasting -with merits and demerits. Numerical Problems. Sources: Surface and subsurface sources suitability with regard to quality and quantity, Collection and Conveyance of water: Intake structures - types of intakes –Factors to be considered in selection of intake structures. Pumps: Types of pumps. Numerical Problems. Pipes: Design of the economical diameter for the rising main; Numerical Problems. BIS' Drinking water quality standard.	**10Hours**
Module-2 **Water Treatment & Distribution:** Objectives, Treatment flow chart – significance of each unit, Aeration- types, Sedimentation- settling tanks types, design. Coagulation -types of coagulants, Filtration-theory, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning. Operational problems in filters. Design of slow and rapid sand filter without under drainage system.	**10Hours**

Softening: Overview of Lime soda, Zeolite process, RO and Nano filtration Disinfection: Methods of disinfection with merits and demerits, Theory of disinfection, Method of Fluoridation and De-fluoridation treatment of water. **Distribution system**: Methods- Gravity, Pumping, Combined gravity and pumping system	
Module-3 **Wastewater & Its Conveyance:** Introduction, need for sanitation, methods of sewage disposal, types of sewerage systems, dry weather flow, wet weather flow, factors effecting dry and wet weather flow on design of sewerage system, estimation of storm flow, time of concentration flow, **Sewer materials**: Material of sewers, shape of sewers, laying and testing of sewers, ventilation of sewers. Sewer appurtenances, manholes, catch basins, basic principles of house drainage, typical layout plan showing house drainage connections, Low-cost waste treatment; oxidation pond, septic tank	**10Hours**
Module-4 **Sewer Design & Effluent Disposal:** Design of sewers, hydraulic formula for velocity, design of hydraulic elements for circular sewers for full flow and partial flow conditions. **Disposal of effluents by dilution**, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, numerical problems on disposal of effluents, Streeter-Phelps equation	**10Hours**
Module-5 **Wastewater Treatment:** Wastewater sampling, significance and techniques, BIS Effluent characteristics of wastewater, flow diagram for municipal waste water treatment, unit operations; screens - types, design, grit chambers, skimming tanks, equalization tanks, **Secondary treatment**: Suspended growth and fixed film bio process, design of trickling filters, activated sludge process, Introduction to sequential batch reactors, moving bed bio reactors, sludge digesters.	**10Hours**

Course outcomes:

After studying this course, students will be able to:

1. Identify the various water demand, available sources and the conveyance of water in municipal water supply scheme
2. Design the water supply scheme treatment units by understanding the basic principle.
3. Quantify wastewater generation and to make suggestions about operation and maintenance of the sewage collection and conveyance systems.
4. Design the sewer system and review the effect of disposal of municipal wastewater to streams and the concept of self-purification capacity
5. Understand and apply the design principles and criteria in designing wastewater treatment units

Question paper pattern:

- The question paper will have ten full questions carrying equalmarks.
- Each full question will be for 20marks.
- There will be two full questions (with a maximum of four sub- questions) from eachmodule.
- Each full question will have sub- question covering all the topics under amodule.
- Thestudentswillhavetoanswerfivefullquestions,selectingonefullquestionfromeachmodule.

Textbooks:

1. S.K.Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi 2010.
2. S.K.Garg, Environmental Engineering vol-II, Sewage disposal and Air Pollution Engineering-M/s Khanna Publishers, New Delhi
3. Metcalf and Eddy, "Wastewater Engineering - Collection, Treatment, Disposal and Reuse", McGraw Hill Pub.Co., 2009
4. .Mark.J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York, 2008.

Reference Books:

1. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P)Ltd., New Delhi 2010
2. Fair, Geyer and Okun , "Water and Wastewater Engineering" Vol-II, John Willey Publishers, New York.
3. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi
4. Manual on Waste Water Treatment : CPHEEO, Ministry of Urban Development, New Delhi.