

WATER ENGINEERING

Paper Code: ETCE-202
Paper: Water Engineering

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: To familiarize the students with the basics of water quality and its treatment methods, importance of planning, analysis and design of modern water supply schemes.

UNIT I

Demand of water: Domestic, commercial and public requirements, Factors affecting demand fluctuations, Estimate of prospective population, fire demand requirements and other allowances.

Sources of water: Estimating the quantity of water from various sources, surface and underground sources, such as, impounded, perennial stream, shallow wells artesian wells, deep wells, infiltration galleries, intake works from different sources.

Water quality: Suspended solids, turbidity, colour, taste odour, temperature, Total dissolved solids, pH, acidity, alkalinity, hardness, nitrates, chlorides, fluorides, metals, organics, nutrients, and Pathogens.

In-stream standards: Potable water standards, waste water / effluent standards, standards for receiving wastes in natural streams / sewer / sea, Bio-monitoring of streams and lakes Groundwater quality, chemical/ biological remediation of ground water.

[T1][No. of Hours: 12]

UNIT II

Water purification processes in natural system: Water pollutants and their sources, Physical processes: Dilution, sedimentation and re-suspension, filtration, gas transfer, heat transfer, Chemical processes, metabolic processes, role of micro-organisms in natural water systems. Stream water quality changes due to waste disposal, Streeter-Phelps D.O. model, and water quality management of rivers having multiple discharges, lakes and estuaries.

[T2][No. of Hours: 11]

UNIT III

Analysis and Design [as per CPHEEO manual etc] of Engineered systems for water purification: Water treatment process and design, economic construction in water works design, solids separation by aeration, settling operations, coagulation, softening, mixing and flocculation, sedimentation.

Analysis and design of other system for water purification: Filtration, disinfection, [Residual chlorine, chlorine demand and break point chlorination] adsorption, membranes, Water plant waste management, Pump drive units and analysis of pumping systems.

[T2,T3][No. of Hours: 12]

UNIT IV

Distribution system: Methods of distributing water, distribution reservoirs, stand pipes and water tanks, design of pumping mains, use of nomograms, appurtenances, distribution systems and their components, capacity and pressure requirements, design of distribution systems, hydraulic analysis of distribution systems.

[T1][No. of Hours: 10]

Text Books:

- [T1] S.K. Garg, "Water Supply Engineering", Khanna Publishers.
[T2] Davis and Cornwell, "Introduction to Environmental Engineering", McGraw Hill
[T3] Peavy, Rowe and Tchobanoglous, "Environmental Engineering", McGraw Hill

References:

- [R1] Henry and Heinke, "Environmental Science and Engineering", Prentice Hall India
[R2] Venugopala Rao, "Principles of Environmental Science and Engineering", Prentice Hall India
[R3] Gilbert M. Masters, "Introduction to Environmental Engineering" Prentice Hall India.
[R4] Kiely, Gerardd "Environmental Engineering" Tata McGraw Hill
[R5] Hammer, Hammer "Water and Wastewater Technology" PHI Learning Pvt. Ltd
[R6] Qasim, Motley, Zhu "Water works engineering" PHI Learning Pvt. Ltd.
[R7] C.D.Gupta, V.K.Gupta "Water Supply Handbook" Jain Brothers