WATER RESOURCE SYSTEM PLANNING

Paper Code: ETCE-411	**L**	**T/P**	**C**
Paper: Water Resource System planning	**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 of 12.5 marks

Objective*: The course will cover the topics of water planning and management by providing in- depth coverage of the tools of analysis, namely econometric principles, Fuzzy rule based model, optimization and simulation, and by providing the theoretical framework for analysis.*

UNIT I

Introduction of Water Systems engineering-scope and approach Issues and the systems planning approach, Water system dynamics, Water Resource [W.R.] development alternatives, Water systems planning objectives, Constraints and Criteria, Economic and Econometric principles, Cost and Benefit Curves.

[T1, R2][No. of Hours: 10]

UNIT II

Application of Linear programming [LP] and Dynamic programming [DP] models in Water Resource Engineering, Problem formulation for W.R. systems, Multi-objective Water Resource Planning, Non-inferior Solutions, Plan Formulation, Weighting Method, Constraint Method, Plan Selection.

Reservoir Operation, Standard Operating Policy, Optimal Operating Policy using LP Rules, Curves for Reservoir Operations

Reservoir Systems [Deterministic Inflow], Reservoir Sizing, Sequent Peak Analysis Neglecting Evaporation, Sequent Peak Analysis Considering Evaporation Loss, Reservoir Capacity using LP , Storage Yield Function, Mixed Integer LP Formulation for Maximizing Yield.

[T2, R2][No. of Hours: 10]

UNIT III

Multireservoir Operation, Stationary Policy using DP, Simulation of Reservoir Operation for Hydropower Generation, Reservoir Systems [Random Inflow], Lognormal and Exponential Distributions, Chance Constrained LP, Linear Decision Rule, Deterministic Equivalent of a chance constraint

Concept of Reliability, Reliability-based Reservoir Sizing, Maximum Reliability, Stochastic Dynamic programming for reservoir operation, State variable discretisation, Inflow as a stochastic process, Steady state operating policy, Steady State Probabilities, Real-time Operation, Case Study.

[T1, T2][No. of Hours: 11]

UNIT IV

Water quality managements planning and associated models, Regional planning models, Policy issues for improvement in utilization of water resources, Optical Irrigation Water allocation for single and multiple crops, Crop Yield optimization.

Applications of Linear Programming in [1] Optimal Irrigation water allocation to multiple crops, [2] Multireservoir system for irrigation planning, [3] Reservoir Operation [Short term] for irrigation, [4] Reservoir operation for Hydropower optimization.

Application of dynamic programming in - [1] Steady State Reservoir operating policy for irrigation, [2] Real-time Reservoir Operation for Irrigation, An Example application for inflow forecasting, Fuzzy Sets and Fuzzy logic, Introduction, Fuzzy rule based reservoir operation model.

[T1, R3] [No. of Hours: 10]

Text Books:

[T1] Water Resources Systems Planning and Management, Sharad K. Jain, 2003 ,Elsevier ,Singh .P.V

[T2] Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications, Daniel P. Loucks, Eelco Van Beek, 2005.

References:

[R1] S.Vedula, P.P.Majumdar-Water Resources Systems, Tata Mcgraw Hill Publishing Company Ltd., ND

[R2] M.C. Chaturvedi, W.R.Systems-Planning and Management, Tata McGraw Hill Publications, New Delhi

[R3] Louks D Petal W.R. System Planning and Analysis, Prentice Hall – 1981.

[R4] Maass. A. eta:-Design Water Resources Systems-McMillan, 1968.

[R5] A.S. Goodman, Principals of Water Resources Planning, Prentice Hall, 1984