WATER RESOURCES SYSTEMS ANALYSIS

Lectures / Tutorials : 4 Periods/Week Sessional marks : 40
Semester End Exam. : 3 Hours Semester End Exam. marks : 60
Credits : 4

Course Objectives:

- To study types of systems and systems approach to water resources planning and management.
- To understand role of optimization in water resource planning, economy and management.
- To study various linear programming models and their applications in water resources.
- To study the concept of dynamic programming and its applications in water resources problems.
- To understand various simulation techniques and to develop simulation models for various water resources problems.
- To study techniques for operation and management of available water resources.

Course Outcomes:

At the end of the course the student will be able to:

- Understand concept of systems approach to water resources planning and management.
- Develop objective function and constraints for various water resources optimization problems.
- Develop linear programming models for water resources problems by using graphical and simplex and revised simplex techniques.
- Carry out sensitivity analysis and post optimality analysis.
- Develop and solve forward and backward recursive dynamic programming models.
- Apply simulation techniques in water resources problems
- Plan for optimal operation of a single reservoir system.
- Able to develop models for allocation of water resource for optimal crop yields.

UNIT I

Concept of System and System Analysis

Introduction, Definition of a system, Types of systems, Systems approach to water resources planning and Management

Optimization

Definition, role of optimization models, objective function and constraints, Types of optimization techniques

UNIT II

Linear Programming –I

General formulation of Linear Programming models, Graphical Method, Simplex method, Application of Linear Programming in Water Resources.

UNIT III

Linear Programming –II

Revised Simplex method, The Dual problem, Sensitivity Analysis, Post optimality Analysis

Dynamic Programming

Introduction; Characteristics of a DP problem; Belman's principle of optimality; Forward and Backward recursive dynamic programming, Application of DP to water resources problems.

UNIT IV

Simulation

Definition, Concepts of a simulation model, steps in simulation, Application of simulation techniques in water Resources.

Water Resources Management

Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, Conjunctive use of surface and sub surface water resources.

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1.Water Resources Systems by S.Vedula and P.P. Majumdar, Tata McGraw-Hill,2005.

REFERENCE BOOKS

1.Water Resources Systems Planning and Analysis by D.P. Loucks, J.R. Stedinger and D.A. Haith, Prentice-Hall, 1983.
2.Operations Research : An Introduction by H.A.Taha, 8th Edition,Pearson Education, 2008.
3 Analysis of water distribution networks by Bhave and Gupta, Narosa Publishing House, 2011.
3. Engineering Optimization : Theory and Practice by SS Rao, 3rd Edition, New Age International, 2010.