

# Water Resources Systems : Modeling Techniques and Analysis - Video course

## COURSE OUTLINE

**Course Description:** The course introduces the concepts of systems techniques in water resources planning and management.

### Course Contents

Introduction – Concepts of Systems and Systems Analysis; Systems Techniques in Water Resources : Optimization with methods using calculus; Linear Programming; Dynamic Programming; Simulation; Combination of Simulation and Optimization; Mutli-objective Planning. Economic Considerations in Water Resources Planning; Reservoir Systems – Deterministic Inflow : Reservoir Sizing; Reservoir Operation – standard operating policy, optimal operating policy; multi-reservoir systems; Reservoir Systems – Random Inflow : Chance Constrained Linear Programming; Concept of Reliability; Stochastic Dynamic Programming; Applications – Reservoir systems operated for Irrigation, Hydropower, Flood Control and Municipal and Industrial Supplies; Water Quality Control in River Systems; Case Studies; Recent Modeling Tools – Artificial Neural networks, Fuzzy Inference Systems; Fuzzy Linear Programming;



# NPTEL

<http://nptel.iitm.ac.in>

## Civil Engineering

### Pre-requisites:

- A preliminary background in surface water hydrology is desired, but not essential.

### Additional Reading:

1. Jain, S.K. and Singh V. P. (2003) Water Resources Systems Planning and Management, Elsevier.
2. Chaturvedi M C (1987) Water Resources Systems Planning and Management, Tata McGraw Hill, New Delhi.

### Hyperlinks:

- <http://www.eolss.net/Sample-Chapters/C07/E2-16-03-01.pdf>
- <http://www.sciencedirect.com/science/book/9780080449678>

### Coordinators:

**Prof. P.P. Mujumdar**  
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**COURSE DETAIL**

<b>S.No</b>	<b>Topic</b>	<b>No. of lectures</b>
1	Introduction – Concepts of Systems and Systems Analysis	01
2	Optimization with methods using calculus	03
3	Linear Programming	05
4	Dynamic Programming	03
5	Simulation	02
6	Combination of Simulation and Optimzation	01
7	Mutli-objective Planning	02
8	Economic Considerations in Water Resources Planning	03
9	Reservoir Sizing – Deterministic Inflows	02
10	Reservoir Operation –	02

	Deterministic Inflows	
11	Simulation and Optimization of Hydropower Systems	01
12	Introduction to Stochastic Optimization (Review of Probability Theory, Concept of Risk)	02
13	Chance Constrained Linear Programming	03
14	Stochastic Dynamic Programming	02
15	Steady State and Real-time Reservoir Operating Policies	01
16	Case Studies	04
17	Recent Modeling Tools (ANN, Fuzzy Inference Systems, Genetic Algorithms)	03
	<b>Total</b>	<b>40</b>

## References:

1. Loucks, D. P. and Elco Van Beek (2005) Water Resources Systems Planning and Management : An Introduction to Methods, Models and Applications., UNESCO, Netherlands.
2. Vedula, S. and Mujumdar, P. P. (2005) Water Resources Systems : Modelling Techniques and Analysis, Tata McGraw Hill, New Delhi.
3. Mays L.W and Tung Y-K, (1992) Hydrosystems Engineering and Management, McGraw Hill, USA.
4. Simonovic, S. P. (2009) Managing Water Resources : Methods and Tools for a Systems Approach, UNESCO Publishing, France.