



S.No.	Topic	No. of Lectures
4	Overland and channel flow simulation	2
5	Modeling approaches and parameters. Stream flow statistics	2
6	Surface water storage requirements	1
7	Flood control storage capacity and total reservoir capacity	2
8	Surface water allocations	1
9	Palaeo-channels	1
10	Ground water models	2
11	Design of nodal network	1
12	General systems frame work	1
13	Description of the model	1
14	Irregular boundaries	1
15	Decision support system using simulation models	2
16	Monte-Carlo approach to water management	2
17	Stanford watershed model and input data requirements of various hydrologic modeling systems	2
18	Soil water assessment tool (SWAT)	2
19	Groundwater modeling and solute transport	2
	<b>Total</b>	<b>32</b>

### IX. List of Practicals

S.No.	Topic	No. of Practicals
1.	Rainfall-runoff models	2
2.	Infiltration models	1
3.	Stanford watershed model (SWM)	1
4.	Channel flow simulation problems	1
5.	Stream flow statistics	2
6.	Model parameters and input data requirements of various software's of surface hydrology and groundwater	2
7.	Hydrologic modeling system. Soil water management model	2
8.	Soil water assessment tool (SWAT). Catchments simulation hydrology model	2
9.	Stream flow model and use of dimensionless unit hydrograph	1
10.	Generalized groundwater models	2
	<b>Total</b>	<b>16</b>

### X. Suggested Reading

- Biswas AK. 1976. *Systems Approach to Water Management*. McGraw Hill.
- Cox DR and Mille HD. 1965. *The Theory of Stochastic Processes*. John Wiley & Sons.
- Eagleson PS. 1970. *Dynamic Hydrology*. Mc Graw Hill.
- Himmel Blau DM and Bischoff KB. 1968. *Process Analysis and Simulation Deterministic Systems*. John Wiley & Sons.
- Linsley RK, Kohler MA and Paulhus JLH. 1949. *Applied Hydrology*. McGraw Hill.
- Schwar RS and Friedland B. 1965. *Linear Systems*. McGraw Hill.
- Ven Te Chow, David R Maidment and Mays LW. 1998. *Applied Hydrology*. McGraw Hill.

**I. Course Title : Reservoir Operation and River Basin Modeling**

**II. Course Code : SWCE 603**

**III. Credit Hours : 2+1**

#### IV. Aim of the course

To provide comprehensive knowledge to the students about water management

plans, demand analysis and water resources planning in river basins including stochastic and deterministic modeling.

## V. Theory

### Unit I

Water resources system analysis: Techniques, concept, objectives and applications.

### Unit II

Identification and evaluation of water management plans. Demand analysis, policy formulation. Water resources planning objectives. Water resources planning under uncertainty.

### Unit III

Definition of terminologies and basic concepts. Theories and principles of IRBM processes/phases in integrated river basin management. River basins, river functions. Human interventions and impacts. River basins in India, related case studies. Water resources planning in river basins. Operational management, tools and methods. Monitoring, acquisition and processing of water resource data.

### Unit IV

Statistical methods. Decision support systems. Deterministic river basin modeling. Stream flow estimation, estimating reservoir storage, mass diagram analysis, sequent peak analysis, single and multi-reservoir operation models. Economics and finance.

### Unit V

Stochastic river basin modeling: Single reservoir design and operation, multisite river basin models, stochastic linear programming operation models.

## VI. Practical

Development of regression models, stochastic models and deterministic models for river basin based on stream flow data. Estimation of reservoir storage and preparation of operation models.

## VII. Learning outcome

The students will be able to develop the model for effective water resources planning for river basins, identification and evaluation of water management plans as well as in-depth knowledge of stochastic and deterministic modeling.

## VIII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Introduction–Concepts of Systems and Systems Analysis; Techniques, objectives and applications	2
	Applications of Water resources system analysis	1
2.	Identification and evaluation of water management plans-water demand analysis, Water resources planning objectives	2
3.	Water resource planning and management approaches-Top-Down Planning and Management; Bottom-Up Planning and Management Integrated Water Resources Management	1
4.	Water resource management policy formulation, Water resources planning under uncertainty	1



S.No.	Topic	No. of Lectures
5.	River basins, river functions, Theories and principles of IRBM processes/phases in integrated river basin management	1
6.	Human interventions and impacts in in integrated river basin management	1
7.	River basins in India- related case studies	1
8.	Water resources planning in river basins- Operational management, tools and methods	2
9.	Water resources planning in river basins - Monitoring, acquisition and processing of water resource data	2
10.	Economic Considerations in Water Resources Planning	1
10.	Deterministic river basin modeling-Stream flow estimation, estimating reservoir storage, mass diagram analysis, sequent peak analysis	2
11.	Deterministic river basin modeling- Reservoir Sizing; Reservoir Operation – standard operating policy, optimal operating policy; multi-reservoir systems,	6
12.	Concept of Reliability	1
13.	Stochastic river basin modeling: Basic probability theory,	2
14.	Single reservoir design and operation-Chance constrained Linear Programming for reservoir operation and design	3
15.	Stochastic river basin modeling: multisite river basin models, Model Formulations and Case Studies- Conjunctive use of ground and surface water; Crop yield optimization, Multi-basin and multi-reservoir systems	1
	<b>Total</b>	<b>33</b>

### IX. List of Practicals

S.No.	Topic	No. of Practicals
1.	Development of regression models	1
2.	Regression analysis	1
3.	Correlation analysis	1
4.	Simple Linear Regression and coefficient of determination	1
5.	Discrete and Continuous probability - Random Variable and Variate	1
6.	Deterministic models for river basin based on stream flow data	1
7.	Stochastic models for river basin based on stream flow data	1
8.	Stochastic river basin modeling	1
9.	Stochastic linear programming operation models	1
10.	Single and multi-reservoir operation models	1
11.	Evaluation of water management plans	1
12.	Evaluation of demand analysis	1
13.	Stream flow estimation	1
14.	Estimation of reservoir storage	1
15.	Preparation of operation models	1
16.	Deterministic river basin planning model	1
	<b>Total</b>	<b>16</b>

### X. Suggested Reading

- Chaturvedi MC 1984. *System Approach to Water Resources Planning and Management*.
- Loucks DP *et al.* 1980. *Water Resources System Planning and Analysis*. Prentice Hall, NJ.
- Major DC and Lenton RL. 1979. *Applied Water Resources System Planning*. Prentice Hall Inc., New Jersey.