

## B.E. Semester: VI

### Department of Civil Engineering

**Subject Name: Hydrology and Water Resource Management (CV605-N)**

**Course Category: Program Course Core (PCC)**

#### A. Objectives of the Course:

- To study occurrence movement and distribution of water that is a prime resource for development of a civilization.
- To enable the students basic understanding about precipitation, runoff, infiltration, evaporation, evapotranspiration, hydrograph, floods and reservoir capacity.
- To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology
- To know the basic principles and movement of ground water and properties of ground water flow.
- To create understanding about features of various types of dam, drought

#### B. Teaching & Evaluation Scheme:

Teaching Scheme				Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE	CIA	Pra/Viva	
hrs	hrs	hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
3	1	0	4	4	3	70	30	20	30	150

#### C. Detailed Syllabus:

##### 1. Introduction, Hydrologic cycle, Climate and water availability, Water balances, Precipitation:

Forms, Classification, Variability, Measurement, Data Analysis, Evaporation and Its Measurement, Evapotranspiration and its Measurement, Penman Monteith Method, Infiltration: Factors Affection Infiltration, Horton's Equation and Green Ampt Method

##### 2. Hyetograph and Hydrograph Analysis:

Hyetograph, Runoff: Drainage Basin Characteristics, Hydrograph Concepts Assumptions and Limitations of Unit Hydrograph, Derivation of Unit Hydrograph S Hydrograph, Flow Duration Curve

**3. Groundwater & Well Hydraulics:**

Occurrence and Movement of Groundwater, Darcy's Law, Governing Ground Water Flow Equations, Factors Governing Ground Water Flow, Types of Aquifers, Porosity, Specific Yield, Specific Retention, Storage Coefficient, Permeability, Hydraulic Conductivity, Hydraulic Transmissibility, Conjunctive Use and It's Necessity

**4. Reservoir:**

Types, Investigations, Site Selection, Zones of Storage, Safe Yield, Reservoir, Capacity Reservoir Sedimentation and Control

**5. Hydroelectric Power:**

Introduction and Components of Hydroelectric Power Plant, Low, Medium and High Head Plants, Power House Components, Hydel Schemes

**6. Flood Management:**

Indian Rivers and Floods, Causes of Flooding, Alleviation, Leevs and Floodwalls Floodways, Channel Improvement, Flood Damage Analysis

**7. Hydrologic Analysis and Design:**

Design Flood, Flood Estimation, Frequency Analysis, Flood Routing Through Reservoirs and Open Channels, Storm Drainage Design

**8. Drought Management:**

Definition of Drought, Causes of Drought, Measures for Water Conservation an Augmentation, Drought Contingency Planning

**9. Water Resources Planning and Development:**

Levels in Planning, Functional Requirements of Water Resources Projects, Steps in Water Resources Planning, Environmental Aspects in Water Resources Planning

**D. Lesson Planning:**

<b>Unit No</b>	<b>Title of the Unit</b>	<b>Minimum Hours</b>	<b>Weightage (%)</b>
1	Introduction, Hydrologic cycle, Climate and water availability, Water balances, Precipitation.	07	15
2	Hyetograph and Hydrograph Analysis	07	15

3	Groundwater	07	15
4	Reservoir	04	10
5	Hydroelectric Power	03	05
6	Flood Management	04	10
7	Hydrologic Analysis and Design	08	20
8	Drought Management	03	05
9	Water Resources Planning and Development	02	05
<b>Total:</b>		<b>45</b>	<b>100</b>

**E. List of Practical/Assignments:**

Unit No	Title of the Unit
1	To determine Manning's co efficient of roughness N for the bed of given flume.
2	To determine the discharge coefficients of broad crested weir and to measure the water surface profile for flow over broad crested weir.
3	To study the measurement of water surface profile for a hydraulic jump.
4	To study the flow over a hump placed in an open channel.
5	To calibrate the Ogee spillway.
6	Experiments on Analogy- Analog Methods: Electrical Analogy-Viscous Analogy
7	Similitude and Model Studies

**F. Instructional method and pedagogy (Continuous Internal Assessment Scheme CIA):**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practical and tutorial which carry 05 marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in tutorial rooms carries 05 marks.
- Viva voce will be conducted at the end of the semester of 05 marks.

- One internal exam of 30 marks is conducted as a part of mid semester evaluation.

### **G. Students Learning Outcomes:**

On the successful completion of this course

- Provide a background in the theory of hydrological processes and their measurement
- Apply science and engineering fundamentals to solve current problems and to anticipate, mitigate and prevent future problems in the area of water resources management
- An ability to manipulate hydrological data and undertake widely-used data analysis
- A systematic understanding of the nature of hydrological stores and fluxes and a critical awareness of the methods used to measure, analyze and forecast their variability; and the appropriate contexts for their application
- Can define the key components of a functioning groundwater, can determine the main aquifer properties – permeability, transmissivity and storage Identify geological formations capable of storing and transporting groundwater
- Different methods and importance of rain water harvesting

### **H. Recommended Study Materials:**

#### **a. Text book & Reference Books:**

1. Garg S.K., Hydrology and Water Resources Engineering
2. Subramanya, K., Engineering Hydrology, Tata McGraw Hill, New Delhi
3. Raghunath, H.M., Groundwater, 1987, Wiley Eastern Ltd., New Delhi
4. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi
5. Todd, D.K., Groundwater Hydrology, 1993 John Wiley & Sons
6. Raghunath, H.M., Hydrology – Principles, Analysis and Design, 1986, Wiley
7. Dr. P.Jaya Rami Reddy, A Textbook of Hydrology, University Science Press

#### **b. Web Materials:**

1. <http://nptel.iitm.ac.in>
2. <http://www.groundwatermanagement.org>
3. <http://www.uiowa.edu>.
4. <http://www.ngwa.org>.

