

23CE506: HYDROLOGY AND WATER RESOURCES ENGINEERING

Topic: Introduction to Hydrology & Precipitation

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Introduction to Hydrology

- **Hydrology is the science dealing with occurrence, distribution and movement of water on earth.**
- **It helps in water resources planning, flood control and irrigation design.**

Hydrologic Cycle

- **Continuous circulation of water between atmosphere, land and oceans.**
- **Main processes: evaporation, transpiration, condensation, precipitation, infiltration and runoff.**

Components of Hydrologic Cycle

- **Evaporation:** conversion of water into vapour.
- **Condensation:** formation of clouds.
- **Precipitation:** water falling from atmosphere.
- **Runoff and groundwater flow complete the cycle.**

Precipitation

- **Precipitation is water released from clouds in liquid or solid form.**
- **It is the main source of water input in hydrological studies.**

Forms of Precipitation

- Rain
- Snow
- Sleet
- Hail

Types of Rainfall

- **Convective rainfall – due to heating of earth surface.**
- **Orographic rainfall – due to lifting of air over mountains.**
- **Cyclonic rainfall – due to atmospheric disturbances.**

Characteristics of Precipitation in India

- **Indian rainfall is mainly controlled by monsoon.**
- **Large seasonal and regional variation exists.**
- **High intensity rainfall occurs during monsoon period.**

Measurement of Precipitation

- Rain gauges are used to measure rainfall.
- Measurements are expressed as depth of water (mm).

Non-recording Rain Gauge

- **Symon's rain gauge is commonly used.**
- **Provides total rainfall over a specified period.**

Recording Rain Gauges

- **Tipping bucket type**
- **Weighing type**
- **Float type**
- **Provides continuous rainfall record.**

Rain Gauge Network

- **Network of stations used for rainfall measurement.**
- **Density depends on terrain, climate and purpose of study.**

Mean Precipitation Over an Area

- **Arithmetic Mean Method**
- **Thiessen Polygon Method**
- **Isohyetal Method**

Missing Rainfall Data Estimation

- **Arithmetic Mean Method**
- **Normal Ratio Method**
- **Inverse Distance Method**

Consistency of Rainfall Records

- **Double Mass Curve method is used.**
- **It identifies and corrects inconsistencies in rainfall records.**

Depth–Area–Duration Relationship

- Shows variation of rainfall depth with area and duration.
- Used in design of hydraulic structures.

Intensity–Duration–Frequency Relationship

- **IDF curves represent rainfall intensity for different durations and frequencies.**
- **Used in drainage and flood studies.**

Probable Maximum Precipitation (PMP)

- **Maximum theoretically possible precipitation for a given duration and area.**
- **Used in design of major dams and flood protection works.**

Rainfall Data in India

- **Rainfall data is collected by meteorological stations.**
- **India Meteorological Department maintains rainfall records.**