Hydrology

What we study in Hydrology?

In hydrology we study Hydrologic cycle, its processes, water balance, precipitation types, estimation of precipitation, and analysis of precipitation data. We also study infiltration phenomena, solution of the Richard's equation and approximate infiltration models.
Methods of measurement of stream flow, stage discharge relation, unit hydrograph theory, Transposition of Hydrograph, Synthesis of hydrograph from basin characteristics, stream flow routing, flood frequency analysis and attenuation of flood flows are also studied in Hydrology.

Definition of hydrology:

"The study of water in all its forms (rain, snow and water on the earth's surface), and from its origins to all its destinations on the earth is called hydrology."

Scope of Hydrology:

1. Water is one the most valuable natural resources essential for human and animal life, industry and agriculture.
2. It is also used for Power generation, navigation and fisheries.
3. Tremendous importance is given to the hydrology all over the world in the development and management of water resources for irrigation, water supply, flood control, water-logging and salinity control, Hydro power and navigation.

Engineering Hydrology:

It uses hydrologic principles in the solution of engineering problems arising from human exploitation of water resources of the earth. The engineering hydrologist, or water resources engineer, is involved in the planning, analysis, design, construction and operation of projects for the control, utilization and management of water resources.
Hydrologic calculations are estimates because mostly the empirical and approximate methods are used to describe various hydrological processes.

Uses of Engineering Hydrology:

Engineering Hydrology Helps in the following ways:

1. Hydrology is used to find out maximum probable flood at proposed sites e.g. Dams.
2. The variation of water production from catchments can be calculated and described by hydrology.
3. Engineering hydrology enables us to find out the relationship between a catchment's surface water and groundwater resources
4. The expected flood flows over a spillway, at a highway Culvert, or in an urban storm drainage system can be known by this very subject.
5. It helps us to know the required reservoir capacity to assure adequate water for irrigation or municipal water supply in droughts condition.
6. It tells us what hydrologic hardware (e.g. rain gauges, stream gauges etc) and software (computer models) are needed for real-time flood forecasting

Hydrological cycle:

1. The hydrologic cycle describes the **continuous re-circulating** transport of the waters of the earth, linking atmosphere, land and oceans.
2. Water evaporates from the ocean surface, driven by energy from the **Sun**, and joins the atmosphere, moving inland as clouds. Once inland, atmospheric conditions act to condense and precipitate water onto the land surface, where, driven by **gravitational forces**, it returns to the ocean through river and streams.
3. The process is quite **complex**, containing many sub-cycles.
4. Engineering Hydrology takes a **quantitative** view of the hydrologic cycle.
5. The quantification of the hydrologic cycle which is an open system can be represented by a **mass balance equation**, where inputs minus outputs are equal to the change in storage.
6. It is a basic Hydrologic Principle or equation that may be applied either on global or regional scale

$$I - O = \Delta S$$

The water holding elements of the hydrological cycle are:

1. Atmosphere
2. Vegetation
3. Snow packs
4. Land surface
5. Soil
6. Streams, lakes and rivers
7. Aquifers
8. Oceans

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