

**GE from GE pool (GE-8): Groundwater management and water quality**

**Credit distribution, Eligibility and Pre-requisites of the Course GE-5**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
<b>GE-8 Groundwater management and water quality</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>12<sup>th</sup> Pass</b>	<b>Nil</b>

**Learning Objectives:**

The course aims to:

- Introduce students to the fundamental principles of groundwater science, including geodiversity, geoheritage, and the hydrologic cycle.
- Familiarize students with the concepts of aquifers, groundwater flow, and aquifer properties, along with basic hydrogeological laws such as Darcy’s law.
- Enable understanding of the principles and practices of groundwater management, including rainwater harvesting and artificial recharge.
- Develop awareness about water quality issues, pollution, contamination, and criteria for domestic and agricultural water use.

**Learning Outcomes:**

By the end of the course, students will be able to:

- Explain the interaction of surface and subsurface water and describe the distribution of groundwater in various geologic formations.
- Identify and classify aquifers, aquitards, aquicludes, and aquifuges and apply the concept of porosity, permeability, and Darcy’s Law in hydrogeological studies.
- Demonstrate understanding of groundwater estimation, watershed management, rainwater harvesting, and artificial recharge techniques.
- Assess and interpret water quality parameters (BOD, COD, DO, etc.) and use graphical tools such as trilinear diagrams to classify water based on its quality for potable and irrigation purposes.

**THEORY**

**(45 Hours)**

**UNIT – I**

**(10 Hours)**

Geodiversity, Geoheritage, Geoconservation and their relationship to geotourism. Concept of Water science and its societal relevance, Hydrologic cycle and interaction of the surface and subsurface water, Vertical distribution of subsurface water.

## **UNIT – II**

**(10 hours)**

Introduction to the concept of porosity and permeability, classification of rocks and sediments as aquifer, aquitard, aquiclude and aquifuge. Types of Aquifer, concept of the piezometric surface and water table and aquifer parameters.

Introduction to Darcy's law and the concept of : static water level, pumping water level, drawdown, radius of influence, cone of depression, specific capacity etc.

## **UNIT – III**

**(13 Hours)**

Introduction to: the basic concept of water balance and the groundwater resources estimation; principles of the groundwater management; rainwater harvesting and artificial recharge to groundwater; aspects of watershed management as an integral part of groundwater management .

## **UNIT – IV**

**(12 Hours)**

Introduction to the concept of water quality, contamination, pollution and water quality parameters: Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), organoleptic; physical; chemical; radioactive and bacteriological parameters. The criteria for portable and irrigation use and graphical representation of the water quality data.

## **Practical (30 hours)**

Preparation and interpretation of water level contour maps and depth to water level maps. Graphical representation of chemical quality data and water classification (Trilinear diagrams). Fundamental exercise on groundwater resources estimation. Basic fundamental exercises on aspects related to designing rainwater harvesting and artificial recharge structures.

### **Essential/recommended readings:**

Todd, D. K. (1980). *Groundwater hydrology, 2ed.* John Wiley. (p. 535).

Karanth K.R., 1987, Groundwater: Assessment, Development and management, Tata McGraw- Hill Pub. Co. Ltd.

### **Suggestive readings:**

Freeze, R. A., & Cherry, J. A. (1979). Groundwater (p. 604). *New Jersey: Prentice Hall Inc Englewood cliffs.*

Syed Tajdarul Hassan. 2017. Introduction to Hydrology. E-PG Pathshala, UGC, MHRD, Govt. of India.