

SEMESTER –IV  
COURSE – IV: Elective Paper - Environmental and Groundwater  
Geophysics

Teaching hours per week	Credits	Internal marks	External marks	Maximum marks
4	4	25	75	100

**Course outcome:**

- Introduces the ground water and its place in hydrological cycle.
- It teaches origin, occurrence, distribution and movement of ground water. Properties of aquifer rocks and types of aquifers.
- Teaches quality aspects of groundwater.
- Discusses about application of geology, geophysics and remote sensing techniques in groundwater investigations.


**After completion of the course, the student can start his/her own enterprise that takes up the issues of ground water investigations for both drinking and agricultural applications and also for testing of groundwater quality.**

**The student will have an opportunity to get placement in government and non-government organisations dealing with groundwater investigations.**

**UNIT I:** Hydrologic Cycle, the groundwater in the hydrologic cycle; Hydrologic budget; Origin and Occurrence of groundwater – Origin of groundwater, rock properties affecting groundwater, vertical distribution of groundwater, geologic formations as aquifers, types of aquifers, groundwater basins and regional groundwater flow systems, springs, hydrothermal phenomena, groundwater in permafrost regions.

**UNIT II:** Groundwater movement – Darcy's Law, verification and validity; Permeability, intrinsic permeability, hydraulic conductivity, transmissivity, hydraulic conductivity of geologic materials, determination of hydraulic conductivity; Groundwater flow rates and flow directions, general flow equation, unsaturated flow, infiltration.

**UNIT III:** Quality of Groundwater – Salinity in groundwater, sources of salinity, measures of water quality, groundwater samples, chemical analysis, physical analysis, biological analysis, water quality criteria, changes in chemical composition, dissolved gases, temperature; Pollution in groundwater – Municipal sources, industrial sources, agricultural sources, miscellaneous sources and their causes; Monitoring of groundwater quality, remediation of contaminated groundwater; Application of various geophysical techniques in ground water pollution identification and mapping.

  
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**UNIT IV:** Saline water intrusion in aquifers – occurrence, structure and shape of fresh-salt water interface, effect of seawater intrusion, control of saline water intrusion, identification of saline water intrusion with the help of geophysical techniques.

Surface and subsurface investigations of groundwater – Geological, remote sensing and geophysical exploration (electrical, seismic and potential field methods) techniques; Application of various geophysical logging techniques (resistivity, SP, natural gamma, gamma-gamma, neutron, temperature, caliper, acoustic etc.) for groundwater investigations.

**Text Books:**

1. David Keith Todd and Larry W. Mays, 2005, Groundwater hydrology, Third edition, John Wiley and Sons, Inc.
2. A.A. R. Zohdy, G. P. Eaton, and D. R. Mabey, 1990, Application of surface geophysics for groundwater investigations, U.S. Geological survey.
3. H. M. Raghunath, 2007, Ground water, third edition, New age international publishers, New Delhi.



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