Ground Water Hydrology - Video course

COURSE OUTLINE

The first course in hydrology/water resources engineering generally introduces the basic concepts, principles and application of the analysis and preliminary design of subsurface structures like wells for relevant components of the hydrologic cycle. This course on “Ground Water Hydrology” focuses on ground water availability/ flow/ storage/ intermixing/ investigation while simultaneously bringing out the advanced/ relevant theories/ practices/ techniques of practical importance. The topics to be covered include introduction, occurrence and movement of ground water, advanced well hydraulics, pollution and quality analysis of ground water, surface/ sub-surface investigation of ground water, artificial ground water recharge, saline water intrusion in aquifers, modeling and management of ground water. The entire course material is quite useful for UG/PG students, teachers and professionals. A number of selected problems will be solved to clearly illustrate the concepts.

COURSE DETAIL

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<tr>
<th>Module No.</th>
<th>Topic</th>
<th>No. of Hours</th>
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<tr>
<td>1.</td>
<td>INTRODUCTION: Ground water utilization &amp; historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations &amp; environmental influence, literature/ data/ internet resources.</td>
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<td>2.</td>
<td>OCCURRENCE AND MOVEMENT OF GROUND WATER: Origin &amp; age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration &amp; saturation, aquifers and their characteristics/classification, groundwater basins &amp; springs, Darcy’s Law, permeability &amp; its determination, Dupuit assumptions, heterogeneity &amp;anisotropy, Ground water flow rates &amp; flow directions, general flow equations through porous media.</td>
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<td>3.</td>
<td>ADVANCED WELL HYDRAULICS: steady/ unsteady, uniform/ radial flow to a well in a confined/ unconfined /leaky aquifer, well flow near aquifer boundaries/ for special conditions, partially penetrating/horizontal wells &amp; multiple well systems, well completion/ development/ protection/ rehabilitation/ testing for yield.</td>
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<td>4.</td>
<td>POLLUTION AND QUALITY ANALYSIS OF GROUND WATER: Municipal/Industrial/agricultural/miscellaneous sources &amp; causes of pollution, attenuation/ underground distribution / potential evaluation of pollution, physical/chemical/biological analysis of ground water quality, criteria &amp; measures of ground water quality, ground water salinity &amp; samples, graphical representations of ground water quality.</td>
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<td>5.</td>
<td>SURFACE/ SUB-SURFACE INVESTIGATION OF GROUND WATER: Geological/geophysical exploration/ remote sensing/ electric resistivity /seismic refraction based methods for surface investigation of ground water, test drilling &amp; ground water level measurement, sub-surface ground water investigation through geophysical / resistivity/spontaneous potential /radiation / temperature / caliper / fluid conductivity / fluid velocity /miscellaneous logging.</td>
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<td>6.</td>
<td>ARTIFICIAL GROUND WATER RECHARGE: Concept &amp; methods of artificial ground water recharge, recharge mounds &amp; induced recharge, wastewater recharge for reuse, water spreading.</td>
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Additional Reading:
1. Literature of the Central Ground Water Board (CGWB); Relevant National/International Journal and/or Conference publications.

Coordinators:
Dr. Anirban Dhar  
Professor/Department of Civil Engineering/IT Kharagpur  
Dr. V.R. Desai  
Associate Professor/Department of Civil Engineering/IT Kharagpur
### SALINE WATER INTRUSION IN AQUIFERS

Ghyben-Herzberg relation between fresh & saline waters, shape & structure of the fresh & saline water interface, upcoming of saline water, fresh-saline water relations on oceanic islands, seawater intrusion in Karst terrains, saline water intrusion control.

### MODELING AND MANAGEMENT OF GROUND WATER

Ground water modeling through porous media/analog / electric analog / digital computer models, ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations, data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction.

### References