

# “Remediation & Management of Polluted Groundwater Sites” Training Workshop

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## Overview

Groundwater serves a major source of drinking water throughout the world. The water quality in aquifers has been impacted in developing and industrialized countries in the last 50 years mainly due to improper disposal of waste and wastewater from population growth and manufacturing of industrial products. An improved understanding of groundwater contamination has become possible since 1980 due to advances in analytical tools and techniques. The technologies for treating contaminated soils and groundwater have rapidly evolved in the last 15 years, and the focus has now shifted in favor of using green and sustainable approaches that employ native microorganisms to destroy pollutants.

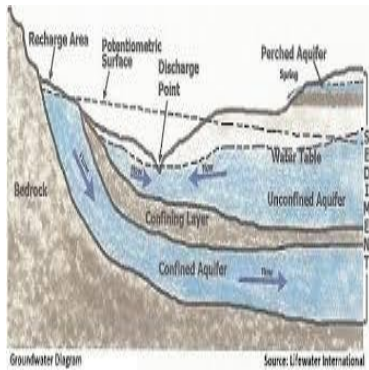
This course discusses the physical, chemical, and biological methods used to remediate inorganic and organic contaminations found in soils and groundwater. The emphasis of the course is on practical applications and technologies that employ sustainable methods. Strategies and technologies to address contamination, including the no-action alternative, natural attenuation, green and sustainable methods, containment techniques, pump-and-treat, and *in situ* destruction technologies, will be reviewed in sufficient technical detail so the student can apply the basic engineering design equations. A review of regulatory requirements is also included; economic constraints that play important roles in the selection of appropriate remediation strategies and treatment technologies will be discussed thoroughly.

### Objectives:

1. Understand the fundamental physical, chemical, and biological principles upon which environmental remediation technologies are based. Understand the engineering, economic, and regulatory limitations of these technologies and practices.
2. Understand what information and data are required to characterize contaminated sites through case studies, and then select from remedial action alternatives.
3. Enhance the knowledge of participants for application of engineering principles and economic and regulatory constraints in order to determine a remedial action strategy and select technologies to implement the strategy for a given data set at a site.

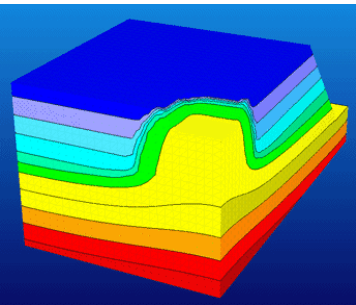
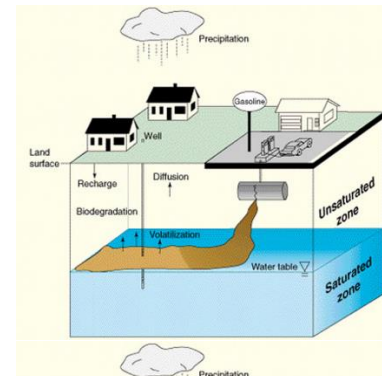
<b>Modules</b>	<b>A: Duration :</b> May 16 - May 29 <b>B: Venue :</b> Department of Hydrology, Indian Institute of Technology Roorkee  <b>Number of participants for the course will be limited.</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ you are a student or faculty from academic institution dealing water related topics;</li> <li>▪ you are a civil/agriculture engineer, or environmental scientist interested in water quantity and quality issues in groundwater systems; interested in remediation and management of polluted soil water system.</li> <li>▪ you are a person from industry/research organization and interested in learning about remediation and management of polluted soil water system and groundwater contamination modelling.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:  <b>Participants from abroad : US \$400</b>  <b>Industry : ₹ 10000</b>  <b>Academic Institutions/Research Organizations: ₹ 5000      Research scholar/student: ₹3000</b></p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, Laboratory equipment usage charges, free internet facility.</p> <p>The participants will be provided with accommodation on payment and availability basis.</p>

# Course module



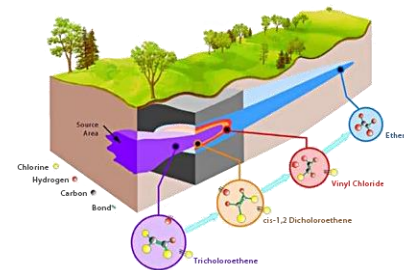
- ❖ Introduction to hydrogeology; aquifer characterization; principles of groundwater flow.
- ❖ Introduction to groundwater contamination; types and sources of conventional contaminants in subsurface; emerging pollutants.
- ❖ Physical, chemical, and biological processes affecting pollutant fate in soil water systems.

- ❖ Subsurface contaminant transport processes: advection, diffusion, dispersion, retardation etc.
- ❖ Introduction to pollutant site remediation plan; review of environmental regulatory framework.
- ❖ Site characterization: goals and approaches; lab analysis and field application



- ❖ Use of multi dimension models to estimate mass transport and transfer , breakthrough curves; contaminated plume development and its behavior
- ❖ Natural attenuation of VOCs – anaerobic pathways, aerobic and abiotic pathways
- ❖ Stoichiometric calculations to estimate electron donor-acceptor relationships; estimating degradation kinetics; Natural attenuation modeling

- ❖ Removal technologies – Encapsulation, Pump-and-Treat; Soil vapor extraction; Air sparging; Soil washing; Thermal treatment, bioventing.
- ❖ Destruction Technologies – Permeable Reactive Barriers; Chemically enhanced metal removal; In situ Redox Manipulation; In situ chemical oxidation
- ❖ Phytoremediation – treatment wetlands; plant solute uptake and rhizospheric modeling
- ❖ Bio stimulation: amendments of electron donors or acceptors (lactate, HRC, oxygen); microbial bio augmentation, Nanotechnology application.



# The Faculty

**Prof. Abinash Agrawal** is employed at Wright State University in Ohio, USA for over 20 years, and has advised many MS and PhD students. Prof. Agrawal has background in Environmental Engineering and Geological Sciences, and he teaches courses in Groundwater Contamination, Site Remediation, Environmental Pollution and Water Quality.



Prof. Agrawal's research interests have been on developing new techniques for in situ destruction of pollutants in soil and groundwater. His research program has received several million dollars from the US Air Force/US Department of Defense in the last 17 years.

His current research focuses on application of nanotechnology and treatment wetlands for remediation of contaminated groundwater. He also collaborates with US Environmental Protection Agency on the fate and treatment techniques of emerging contaminants, particularly those found in wastewater, and recycling and reuse of grey water. Prof. Agrawal has published extensively and made 50+ presentations at various international conferences.

**Dr. Brijesh Kumar Yadav** is an Assistant Professor at Department of Hydrology, IIT Roorkee since June 2012. He is an awardee of the prestigious Ramanujan Fellow by Government of India and has received many research and consultancy projects from various funding agencies.



Dr. Yadav received his B.E. in Agricultural Engineering from CTAE Udaipur and completed M.Tech. in Civil Engineering (Water Resources) from IIT Delhi. Subsequently, he started his doctoral work at IIT Delhi on "Mathematical Model of Phytoextraction for Contaminated Soils". In November 2006, he moved to UNESCO-IHE (Institute for Water Education) Delft, Netherlands and worked on his PhD research with the

Pollution Prevention and Control group in the Environmental Resources Department for two years. Then he moved to Utrecht University, Netherlands for his postdoctoral work with Environmental Hydrogeology group in Department of Earth Sciences. Subsequently, he worked at University of California, Davis from July-December 2010 on subsurface modeling. From January 2011- June 2012, Dr. Yadav was working as a Ramanujan fellow in Department of Civil Engineering at IIT Delhi before joining the faculty position at IIT Roorkee.

In addition, he is teaching an undergraduate (Engineering hydrology) and postgraduate courses: 1) Groundwater hydrology, 2) Water resources system analysis, and 3) Soil-water contamination modelling along with supervision of PhD and MTech students at IIT Roorkee. His current research focuses on multiphase flow modelling, soil water flow and solute transport analysis, Nonpoint source pollutant movement through deep and heterogeneous vadose zone, Phytoremediation of heavy metal polluted sites, Bioremediation of hydrocarbon polluted soil and groundwater resources, CO<sub>2</sub> sequestration in subsurface and risk analysis. Dr. Yadav has published more than 15 peer reviewed international journals and made about 30 presentations at various international conferences/workshops.

## ABOUT ROORKEE

Roorkee is a part of the State of Uttarakhand and is located at the foothills of Himalayas. Roorkee Railway Station is on the main line of Northern Railways having direct links to Delhi, Mumbai, Calcutta, Amritsar, Jodhpur and Shri Ganga nagar. The place is also within easy reach by road from Delhi (200 km) and Chandigarh (180 km). It is located on Delhi – Haridwar and Delhi – Dehradun bus routes.



## Course Co-ordinator

**Dr. Brijesh Kumar Yadav**  
Assistant Professor

Department of Hydrology  
Indian Institute of Technology Roorkee  
01332-284755 (O), 8979534484 (M)

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[brijeshy@gmail.com](mailto:brijeshy@gmail.com)

**REGISTRATION  
AND  
ACCOMODATION REQUEST FORM**  
(To reach electronically by 28th April, 2016)

**Remediation & Management of Polluted Groundwater Sites  
TRAINING WORKSHOP  
May 16-29, 2016  
Department of Hydrology, Indian Institute of Technology Roorkee  
Roorkee, Uttarakhand**

After Completion, please mail to:

<b>Dr. Brijesh Kumar Yadav,</b> <b>Department of Hydrology, IIT Roorkee</b> <b>Roorkee – 247 667 (Uttarakhand)</b> <b>Phone: (01332)284755, Fax: (01332) 2273560</b> <b>Email: <a href="mailto:brijkfhy@iitr.ernet.in">brijkfhy@iitr.ernet.in</a>,</b> <b><a href="mailto:brijeshy@gmail.com">brijeshy@gmail.com</a></b>	Affix passport size photograph
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1. Name of applicant (in block letters): Ms./Mr. ....
2. Designation .....
- 3a. Residential address with pin code  
Tel:  
Mobile:
- 3b. Official address with pin code  
Phone (Off.) Fax: Email:  
Fax: Email:
- 3c. Name of the Institute where employed
- 3d. Name of the Department
4. Highest Academic Qualification
5. Branch of Specialization
6. Teaching Experience in Years

**Date:**

**Signature of applicant**

Note:

- (i) Application should reach DOH Office at the above address latest by 30th April, 2016. Scanned copy may be sent by e-mail.
- (ii) Please come to Roorkee to attend the workshop, only if you have received intimation.