

# Moment Analysis for Contaminant Fate and Transport

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## Overview

India relies on strong agricultural and industrial sectors to serve the population and to enhance the overall quality of life. High yields from these sectors are often accompanied by a host of environmental problems in the form of increased use of fertilizers and pesticides in agriculture, or generation of harmful byproducts in industrial operations. Consequently, understanding and analyzing the fate and transport of contaminants as they move from source to receptor locations is needed to design effective abatement strategies and to formulate informed remediation plans. Our understanding is derived from carefully controlled laboratory and field experiments combined with various mathematical models to describe the physical, chemical, and biological processes that influence contaminant behavior.

In this regard, many applications of solute transport lend themselves to moment analysis of the partial differential equations governing contaminant fate and transport. Apart from the motivation for applications in parameter estimation, moment analysis is useful for providing insights into contaminant behavior, and elucidating the relative roles of physical, chemical and biological processes that exert control on contaminant movement.

The primary objectives of this course are:

1. To provide fundamentals of contaminant transport in the context of moment analysis
2. To train participants in conducting moment analysis using mathematical and numerical methods for different contaminant transport models
3. To demonstrate the efficacy of moment analysis, while highlighting the strengths and limitations of this technique through examples

<b>Modules</b>	<p><b>Moment analysis for fate and contaminant analysis : March 20 – March 24, 2018</b></p> <p>Day 1: Introduction to advection-dispersion equation and parameter estimation problems</p> <p>Day 2: Fourier &amp; Laplace transforms for solute transport problems; moment generating functions</p> <p>Day 3: Stochastic models of solute transport</p> <p>Day 4: Spatial and temporal moment analysis for solute transport; Demonstration of an experimental setup for advection-dispersion in laboratory soil columns</p> <p>Day 5: Moment generating differential equations</p> <p><b>Number of participants for the course will be limited to forty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are an engineer or scientist from industry, research labs, and organizations involved with contaminant transport problems</li> <li>▪ You are a student or a faculty member working in the area flow and contaminant transport</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry/ Research Organizations: INR 10000</b></p> <p><b>Academic Institutions: Faculty Members INR 5000 Students INR 2000</b></p> <p>The participants will be provided with accommodation on payment basis.</p>

## The Faculty



**Rao S. Govindaraju** is Bowen Engineering Head of Civil Engineering and Christopher B. and Susan S. Burke Professor of Civil Engineering at Purdue University USA. His research interests include watershed hydrology, stochastic and statistical hydrology, spatial variability, modeling surface and subsurface water movement, fate and transport of contaminants, and machine learning applications in hydrology.



**Ashu Jain** is a Professor of Civil Engineering at IIT Kanpur. His research interests are hydrologic modeling using conceptual and artificial intelligence techniques, stochastic hydrology, and extraction of physical knowledge from trained ANN hydrologic models



**Rajesh Srivastava** is a Professor of Civil Engineering at IIT Kanpur. His research interests are flow and transport through porous media, groundwater pollution, climate change, and sediment transportation.



**Saumyen Guha** is a Professor of Civil Engineering at IIT Kanpur. His research interests include subsurface flow and transport, bioremediation of toxic organics in the natural systems, fate and transport of pesticides and heavy metals in the natural systems, metal uptake in plants, and natural Isotopes.



**Richa Ojha** is an Assistant Professor of Civil Engineering at IIT Kanpur. Her research interests are flow and transport in porous media, scaling of hydrological processes, and hydrologic extremes.



**Shivam Tripathi** is an Assistant Professor of Civil Engineering at IIT Kanpur. His areas of research interests include statistical hydrology, sediment transport, and ecohydrology.

## Course Co-ordinator

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