

# Role of Fluid Flow and Mass Transport in Porous Media for Design of Chemical Reactors for Groundwater Remediation

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## Overview

Groundwater water flow and mass transport constitutes one of the most important components of the natural hydro-environmental systems. The vulnerability of groundwater to various pollutants urge for the development of appropriate remediation techniques of polluted ground water. The proposed course is based on the reasoning that designing a program for remediating environmental pollutants in the groundwater requires a thorough knowledge of fluid flow and mass transport processes in the subsurface as well as the issues relating to the design and optimization of chemical reactors.

Permeable reactive barrier (PRB), which is a low-cost technology to clean or remediate the contaminated groundwater, has gained significant acceptance worldwide, although its use/application in the Indian conditions have not been explored to a large extent. Dissemination of knowledge on topics involving PRB in the Indian context, is therefore, an ideal step in mitigating and remediating various groundwater aquifers of the country. The overarching objective of this course is to develop an understanding of the design of chemical reactor for treatment of environmental pollutants in the subsurface (saturated and unsaturated regions) and their dependence on the fluid flow and mass transport in these domains. Modeling is an essential tool in understanding and designing the bio-physico-chemico processes involved in contaminant transport processes. It is necessary for a reliable/realistic model to answer several relevant questions, such as, what is the purpose of the predictive calculations, what level of precision is expected, what are the advantages and disadvantages of the developed approach, etc. For this reason, the application of model in designing PRBs is emphasized in this course.

On completion of this course, the participants should be able to develop an understanding of the general theories of flow and mass transport in porous media, reactor design and optimization, parameter estimation using appropriate experimental techniques, and determine the relationships between the parameters and, coupled processes that govern contaminant transport and remediation. The participants should also be able to appreciate how to integrate theory and practice to analyse specific contamination problems and develop concepts for the remediation of the environmental pollutants. This course is organized for one week involving 15 hours of lectures, 5 hours of tutorials and 4 hours of laboratory demonstration. The lecture notes, case studies, and assignments will be shared to stimulate research motivation of participants.

<b>Modules</b>	Single Module of one week from <b>20<sup>th</sup> August-2018</b> to <b>24<sup>th</sup> August 2018</b> <b>(Number of participants for the course will be limited to fifty.)</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are an environmental engineer / subsurface hydrologist / chemical engineer / interested in designing and implementing Permeable Reactive Barriers for groundwater remediation.</li><li>▪ You are scientists from governmental or private R&amp;D Laboratories and Industries (Oil, Chemicals, etc.) associated with environmental projects and interested to learn on remediation techniques.</li><li>▪ You are a student or faculty from academic institution interested in learning principles and how to do research on PRBs for remediation.</li></ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad : US \$500</b> <b>Industry/ Research Organizations: INR 15000</b> <b>Academic Institutions (Faculty): INR 5000</b> <b>Academic Institutions (Students): INR 1000</b> The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Dr. Diganta B. Das** is an Associate Professor/Senior Lecturer of Chemical Engineering, and the Theme Leader of the Process Engineering Research Group in the School of Automotive, Aeronautical, Chemical and Materials Engineering at Loughborough University (LU), Leicestershire, UK. Dr. Das is also the Deputy Academic Lead of the University Global Research Challenge on Changing Environment and Infrastructure. He also helps co-ordinate the water engineering related research activities within the recently formed Midlands Innovation Partnership (MIP) of 8 Midlands Based Universities in the UK. His broad research interests are – multiphase flow in porous media; dynamic capillary effects; groundwater contaminant and solute transport; and solid waste management, etc.



**Dr. Suresh A. Kartha** is an Associate Professor in the Department of Civil Engineering at Indian Institute of Technology, Guwahati. He has done his PhD in the area of flow and transport in porous media from IIT Kanpur and thereafter joined IIT Guwahati as a faculty. His broad research interests are – flow and transport through porous media; landfill leaching; heap leaching of metals; groundwater flow and contaminant transport; hydrology; and numerical modeling; etc.

## Course Co-ordinator

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