Groundwater Modeling Characterization and Management

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Overview

Water as a renewable economic resource is expected to be the main focus in the coming decades and groundwater will remain an important component of it. Also, during the last two decades increasing attention has been focused on the quality and sustainability aspects of water. It is now well recognized that groundwater availability and its associated quality are equally important. Groundwater will remain an important economic resource. Large scale management of groundwater aquifers for efficient sustainable utilization will require development and application of methodologies and tools for better analysis and prediction of groundwater availability, capable of prescribing strategies for its long-term sustainable use in conjunction with surface water, identification of the pathways and sources of contamination, design of efficient management and monitoring strategies, and efficient design of contamination remediation strategies. Unplanned and extensive human interventions often without any regional scale view have led to over exploitation and wide spread deterioration of groundwater quality. In order to address all the associated groundwater management issues in a larger regional scale, it is necessary to (i) avail adequate and reliable information regarding the complex geology of the aquifer; (ii) develop suitable mathematical simulation models incorporating reliable estimates of hydrogeological and geochemical parameters, to describe the likely impacts of human interventions; and (iii) utilize a suitably formulated decision model capable of prescribing as solution a set of strategies for optimal management of aquifers.

Simulation models generally play descriptive roles and can simulate and predict the impact of any imposed management strategy. Simulation Models can also simulate and predict the impacts of various contamination control and remediation strategies. However, sole use of simulation tools ideally requires exhaustive and indirect search for the best possible solution or option, and often leads to suboptimal solutions due to inadequacy of the indirect search through simulation. Optimization approach on the other hand is capable of identifying the best possible solution or strategy by solving an appropriately formulated optimization model with defined objectives and managerial and/or physical constraints. An important related issue is the computational complexity of an adequate and reliable simulation model representing the physical processes and to improve the computational tools to deal with such highly nonlinear large scale systems. Therefore this course will cover the fundamentals of groundwater flow and contaminant transport process simulation, numerical models available for flow and transport simulation and their uses, fundamentals of optimum decision models especially related to regional scale sustainable groundwater quality and quantity management, monitoring network design for economy and efficiency in contamination detection and delineation, as well as for characterization of unknown pollutant sources and control of saltwater intrusion in coastal aquifers. This course will address the fundamental of modeling the processes, relevant numerical simulation models, and extend the coverage to the most advanced computational tools integrating use of simulation and optimization models and tools for large scale sustainable management of groundwater aquifers. A number of real life applications of the different methodologies both in India and Australia will be discussed.

All Lectures will be delivered by internationally renowned faculties from India and abroad. This course will cover the fundamental aspects as well as state-of-the-art techniques of modeling and simulation as well as optimization based decision models. Specialized applications such as contaminated mine sites, contaminated aquifers in urban areas, and costal aquifers saltwater management will be covered. The course is intended to be useful to practicing engineers, agricultural professionals, water resources managers, hydrogeologists, environmental scientists and students.

Modules	**A: Basic Concepts of Groundwater Modeling and Management : Dec5 - Dec7, 2016** **B: Applications of Groundwater Management : Dec8 -Dec 13, 2016** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ you are aB.Tech. / M.Tech./ M.S. (Masters) / Ph.D. student of Civil Engineering, Agricultural Science and Engineering, Geological Sciences, Environment engineering and Science, Water Resources Engineering. ▪ you are a faculty member or Research Associate from academic institutions/ technical institutions. ▪ you are apracticing engineer/professional connected to relevant fields/ water resources manager.
Fees	The participation fees for taking the course is as follows: **Participants from abroad: US $500** **Industry/ Research Organizations:** **Any of two modules: Rs. 20000/- All modules : Rs. 30000/-** **Academic Institutions:** **Teachers: Rs. 10000/- (All modules)** **Students: Rs. 2000/- (All modules)** 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

Prof. BithinDattacurrently at Discipline of Civil and Environmental Engineering, College of Science Technology and Engineering, at James Cook University, Australia, He is also the Team Leader, Water Quality and Contaminants Research Group, TropWATER (Centre for Tropical Waters and Aquatic Ecosystem Research) at James Cook University, and at CRC-for Contamination Assessment and Remediation of the Environment (CRC-CARE), Australia.He is internationally well known for his pioneering research work on Optimal Identification of unknown pollution sources in contaminated groundwater aquifers, design of optimal monitoring networks incorporating uncertainties for management of contaminated aquifers, management of coastal aquifers for saltwater intrusion control and remediation, and real-time operation of water reservoir systems.

Dr. AnirbanDharis currently an Assistant Professor of Civil Engineering at Indian Institute of Technology Kharagpur. He specializes in analysis of water and environmental systems. His other research interests are groundwater hydrology and computational hydraulics. He has published widely in his chosen areas of academic endeavor.

Course Coordinator

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